Essays on entrepreneurial entry and exit

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Deutschsprachige Zusammenfassung

Die vorliegende Arbeit untersucht das Ein- und Austrittsverhalten von Unternehmern bzw. Unternehmen. Hierbei wird in der Einleitung ein Überblick über die ökonomischen Auswirkungen von Unternehmensgründungen bzw. Firmeneintritten in Märkte sowie von Unternehmensaufgaben und Firmenaustritten diskutiert. Weiterhin behandelt das erste Kapitel individuelle und Umweltbedingungen, die Unternehmensgründungen begünstigen oder erschweren. Auch werden Faktoren untersucht, die zu Unternehmensaufgaben führen. Eine zentrale Rolle für Firmenein- und austritte spielt der Industrielebenszyklus. Die Ansätze Technologiemanagement, Evolutionsökonomik und Organisationsökologie und deren Erklärung für die Anzahl der Unternehmen in einer Industrie über die Zeit werden am Ende des ersten Kapitels dargestellt.

Kapitel 2 besteht aus einer Studie zum Grad der Marktneuheit von Kleinunternehmen im Hochtechnologiebereich bei der Unternehmensgründung. Das Konstrukt „Marktneuheit“ basiert hier auf einem theoretischen Fundament, dass Märkte aus prozeduraler Sicht betrachtet. Dementsprechend besitzen Märkte in bestimmten Entwicklungsstadien charakteristische Attribute, welche sich im Zeitablauf verändern. Auf der anderen Seite findet in der derzeitigen Gründungsforschung eine Diskussion statt, ob unternehmerische Opportunitäten von Unternehmern geschaffen oder entdeckt werden. In unserer Studie nehmen wir an, dass bei relativ neuen Märkten eher Opportunitäten geschaffen werden und über die Marktentwicklung hinweg mehr und mehr die Entdeckung von Opportunitäten eine Rolle spielt. Diese These nutzen wir um unsere Hypothesen bezüglich der Determinanten der Marktneuheit von Gründungen zu entwickeln.

Die Gründungsforschung sieht hier einen Zusammenhang von unternehmerischer Erfahrung und Marktneuheit vor. Außerdem impliziert die Theorie einen negativen Zusammenhang zwischen Marktneuheit und industrieähnlicher Erfahrung. Ein unternehmerisches Persönlichkeitsprofil trägt in der Theorie zur Schaffung neuer Märkte bei. Schlussendlich wird aus einer prozeduralen Marktperspektive ein unterschiedliches Innovationsverhalten von Unternehmern wahrscheinlich. Folglich herrscht in jungen Märkten eine reine Produktinnovationsstrategie vor. Reifen Märkte dann weiter kommt mehr und mehr ein stabiles Produktdesign auf und eine Produkt- sowie Prozessinnovationsstrategie

ist am vielversprechendsten. In Märkten mit hoher Reife existiert ein stabiles Produktdesign. Aus diesem Grund werden Produktinnovationen überflüssig und eine reine Prozessinnovationsstrategie ist am sinnvollsten für Gründer.

Wir entwickeln eine „Marktneuheits-Skala“ bestehend aus 4 Items. Die verwendeten Daten der Untersuchung sind Bestandteile der Thüringer Gründerstudie. Die Thüringer Gründerstudie ist eine Befragung von Firmengründern in Thüringen, die in Industrien operieren, in welchen durchschnittlich mehr als 3,5% des Umsatzes für Forschung und Entwicklung ausgegeben wird. Um die oben beschriebenen Zusammenhänge zu testen, verwenden wir eine Quantile-Regression, da die Verteilung der Marktneuheitsskala schief ist.

Wir finden, dass Marktneuheut von Gründungen nicht mit unternehmerischer Erfahrung zusammenhängt, jedoch negativ mit industrieähnlicher Erfahrung. Weiterhin ist ein unternehmerisches Persönlichkeitsprofil positiv korreliert mit der Marktneuheit von Unternehmen. Allerdings, hält diese Beziehung nur in den obersten Quantilen von Marktneuheit. Wie erwartet, gibt es unterschiedliche Innovationsstrategien in Abhängigkeit der Marktneuheit. So nutzen Unternehmensgründer eine reine Produktinnovationsstrategie bei hoher Marktneuheit, eine Produkt- sowie Prozessinnovationsstrategie bei mittlerer Marktneuheit und keine oder eine reine Prozessinnovationsstrategie bei geringer Marktneuheit.

Kapitel 3 behandelt das Ein- und Austrittsverhalten von Firmen über den Lebenszyklus einer Industrie. Es wird angenommen, dass sich unterschiedliche Unternehmensresourcen und Fähigkeiten auf den Erfolg vor und nach (technologischen) Strukturbrüchen auswirken. Demzufolge ist der Firmeneintritt eine endogene Entscheidung und das Überleben in einer Industrie die Folge des Zusammenpassens zwischen benötigten und vorhandenen Firmenresourcen und –fähigkeiten.

Wir testen diese Fragestellung mithilfe der deutschen Traktorenindustrie. Hierfür würden die Ein- und Austrittszeitpunkte aus der Industrie von insgesamt 246 Produzenten erhoben. Weiterhin konnte die Branchenerfahrung (vor dem Eintritt) und der Standort ermittelt werden. In der deutschen Traktorenindustrie entstand ab 1927 ein neuer Nischenmarkt für den Allzwecktraktor auf kleinen Landwirtschaftsgütern. Dieser entwickelte sich zum dominanten Markt, da insbesondere nach dem ersten und zweiten Weltkrieg in Deutschland große

Landwirtschaftsgüter wegfielen und kleinere Güter in Süddeutschland die Nahrungsmittelproduktion in Deutschland sicherstellen mussten. Aus diesem Grund eignet sich die deutsche Traktorenindustrie als Exempel um den Effekt von Strukturbrüchen auf das Ein- und Austrittsverhalten von Firmen zu untersuchen.

Wir verwenden eine Hazard-Rate-Regression in Kombination mit einem Propensity-Score-Weighting um für die Endogenität des Firmeneintritts zu kontrollieren. Wir können zeigen, dass nach der Entstehung des neuen Nischenmarktes für den Multifunktionstraktor vermehrt auch Unternehmen aus Süddeutschland, welche die lokalen und kulturellen Gegebenheiten kennen, in den deutschen Traktorenmarkt eintreten. Weiterhin besteht ein Zusammenhang zwischen dem Eintritt nach 1927 und einem Hintergrund in der Produktion von Landmaschinen. Nach der Kontrolle des endogenen Eintritts können wir zudem feststellen, dass diejenigen Unternehmen nach 1927 länger überleben, welche aus Süddeutschland stammen und einen Hintergrund in der Produktion von Landwirtschaftsmaschinen besitzen.

In **Kapitel 4** wird unternehmerisches Scheitern bei hochinnovativen Unternehmen untersucht. Die Operationalisierung von Scheitern stellt in den meisten Studien ein Problem dar. Aus diesem Grund verwenden wir zum Teil externe Daten inwiefern die untersuchten Unternehmen Insolvenz angemeldet haben. Zum anderen wurden die jeweiligen Unternehmer gefragt, ob sie Ihre Unternehmen aufgrund ökonomischer Ursachen verlassen haben. Durch diese Prozedur stellen wir sicher das erfolgreiche Austritte ausgeschlossen werden. Ein anderes potentielles Problem speziell bei Untersuchungen zur Innovationstätigkeit stellt die Selbstselektion von Unternehmern in die Innovationstätigkeit dar. Um Selbstselektions-Bias zu verringern, verwenden wir einen Propensity-Score Ansatz. Wir verwenden wieder Unternehmer Daten aus der oben beschriebenen Thüringer Gründerstudie.

Wir testen verschiedene Einflussfaktoren auf das Scheitern. Verschiedene Studien über unternehmerisches Scheitern heben unternehmensexterne sowie interne Scheiten-Faktoren hervor. Einen prominenten externen Aspekt für Scheitern stellen industriespezifische Kosten und Einnahmeschocks dar. Wir testen diesen Zusammenhang und finden wie erwartet einen negativen Zusammenhang. Da sich die Studie insbesondere mit innovativen Unternehmern auseinandersetzt, testen wir die Relation von Innovation und Scheitern. Wie theoretisch erwartet, verringert eine Innovationsstrategie die Wahrscheinlichkeit zu Scheitern bei den

unternehmensinternen Faktoren.

Ein weiterer wichtiger unternehmensinterner Gesichtspunkt ob innovative Unternehmungen Scheitern ist die Gründerpersönlichkeit. Wir nehmen an, das diese insbesondere die erfolgreiche Implementierung von Innovationen und somit auch das unternehmerische Scheitern beeinträchtigt. Um die Gründerpersönlichkeit zu messen nutzen wir das Big-Five-Persönlichkeits-Inventar (Extraversion, Verträglichkeit, Gewissenhaftigkeit, Offenheit, Neurotizismus). Theoretische Studien legen nahe, dass von den Big-Five Persönlichkeitsdimensionen insbesondere Offenheit, Extraversion und Gewissenhaftigkeit die erfolgreiche Implementierung von Innovationen beeinträchtigen können.

Wir finden, in Übereinstimmung mit unseren Hypothesen, dass Offenheit die erfolgreiche Implementierung von Innovationen erschwert und es somit einen positiven Moderationseffekt von Offenheit auf den Zusammenhang von Innovation auf Scheitern gibt. Dieser Effekt kann dadurch erklärt werden, dass sehr offene Unternehmer eher auf den Neuartigkeitsaspekt als auf das Generieren von finanziellen Überschüssen fokussiert sind. Weiterhin finden wir einen negativen Moderationseffekt von Extraversion auf den Zusammenhang von Innovation auf unternehmerisches Scheitern. Wir erklären dieses Ergebnis mit der Fähigkeit von extravertierten Unternehmern, ihre Kommunikationsstärke auszuspielen und so vergleichsweise leichter an finanzielle Ressourcen gelangen. Außerdem sind extrovertierte Unternehmer besser in der Lage, die Innovation gegenüber Kunden erfolgreich zu kommunizieren. Entgegen unserer Hypothese, trägt Gewissenhaftigkeit nicht zur erfolgreichen Implementierung von Innovationen bei. Vielmehr besteht ein positiver Moderationseffekt von Gewissenhaftigkeit auf die Innovation-Scheitern Relation. Dieses Resultat erklären wir damit, dass Gewissenhaftigkeit die Anpassungsfähigkeit sowie die Kreativität von Unternehmern möglicherweise einschränkt. Diese Eigenschaften sind jedoch erforderlich um Unsicherheiten zu überwinden, die bei der Implementierung von Innovationen zum Scheitern führen können.

Das Hauptaugenmerk von **Kapitel 5** liegt Verhältnis von verschiedenen Austrittsmotiven und der Unternehmerpersönlichkeit. Neben unternehmerischen Scheitern gibt es noch andere Gründe für einen Austritt des Unternehmers. In der vorliegenden Studie wird in persönliche, firmeninterne und finanzielle Austrittsmotive unterschieden. Genauer wird in Austritt wegen (1) Überinvestierung

ihrer finanziellen Mittel, (2) Austritt wegen der Unzufriedenheit mit der Unternehmertätigkeit, (3) Austritt wegen Spannungen im Gründerteam und (4) andere Austrittsmotive. Ich nehme an, dass die Unternehmerpersönlichkeit eine tragende Rolle bei der Erklärung der unterschiedlichen Austrittsmotive spielt. Es wird wiederrum auf das Big-Five-Persönlichkeitsinventar (Extraversion, Verträglichkeit, Gewissenhaftigkeit, Offenheit, Neurotizismus) zurückgegriffen um die Persönlichkeit des Unternehmers zu messen. Die Daten zur Verwirklichung dieser Untersuchung stammen wieder aus der oben bereits beschriebenen Thüringer Gründerstudie.

Um den Zusammenhang zwischen Unternehmerpersönlichkeit und unterschiedlichen Austrittsmotiven zu testen, wurden die Unternehmer nach Ihren Austrittsmotiven befragt, wobei mehrere Antworten möglich waren. Es wird ein stratifiziertes Cox-Modell verwendet um ökonometrische Robustheit zu gewährleisten, da sich die Austrittsmotive z.T. überschneiden.

Es wird theoretisch angenommen, dass Neurotizismus die Wahrscheinlichkeit eines Austritts wegen Überinvestition finanzielle Mittel verringert, das neurotische Unternehmer risikoaverser sind und grundsätzlich weniger unter Unsicherheit investieren. Diese Annahme kann auf Basis der vorhandenen Daten nicht bestätigt werden.

Im Zusammenhang mit dem Austritt wegen der Unzufriedenheit mit der Unternehmertätigkeit legt die Literatur nahe, dass sich Extraversion als auch Neurotizismus positiv auf dieses Austrittsmotiv auswirken. Extraversion führt zu positiver Emotionalität und bei Unzufriedenheit zu einem schnelleren Austritt. Demgegenüber führt Neurotizismus über negative Emotionalität und einem höheren Auftreten von Unzufriedenheit im Beruf, was die Austrittswahrscheinlichkeit erhöht. Ich finde beide Hypothesen in den Daten bestätigt.

Austritte wegen Spannungen im Gründerteam können aus theoretischer Sicht durch Neurotizismus und Verträglichkeit hervorgerufen werden. Neurotische Unternehmer neigen zu negativer Emotionalität und zu kontraproduktiven Verhaltensweisen bei der Arbeit. Auf der Anderen Seite führt Verträglichkeit zu einer besseren Leistung in Teams und zu einem besseren Kooperationsverhalten. In der Datenauswertung zeigt sich allerdings nur ein negativer Zusammenhang zwischen Verträglichkeit und Austritt wegen Spannungen im Gründerteam.

Die Arbeit schließt mit einer Zusammenfassung und Implikationen für die

zukünftige Forschung ab. Hervorzuheben ist hier insbesondere, dass die vorliegende Arbeit die Wichtigkeit der Multidimensionalität von Ein- und Austrittsvariablen heraus hebt. Die Nichtbeachtung dieses Phänomens kann sowohl in der Forschung als auch bei politischen Maßnahmen, die auf eindimensionalen Ein- und Austrittsvariablen besteht, zu falschen Schlussfolgerungen oder Maßnahmen führen. Weitere wichtige Implikationen für die Wissenschaft betreffen die Endogenität von unternehmerischem Eintritt. Hier kann eine Nichtberücksichtigung zu Verzerrungen im Schätzer und somit zu falschen Ergebnissen führen.

When you cut into the present, the future leaks out.

William S. Burroughs

1 Chapter: Introduction

1.1 Economic relevance of entrepreneurial entry and exit

The present thesis deals with entrepreneurial entry and exit. Within this thesis, I treat the individual and the firm perspective on entrepreneurial entry and exit.

Since the seminal work of Schumpeter (2002), entrepreneurial entry and exit at the firm-level is attributed to be a phenomenon of „creative destruction“, which indeed describes two dimensions in the development of economies. On the one hand, entry leads to the creation of entirely new markets or industries, and is the foundation for their evolution (Gort and Klepper, 1982), which in turn drives economic growth (Metcalfe et al., 2006). Firm entry also stimulates competition, productivity and innovation. And, most importantly, entry positively affects employment in the long run. All these phenomena are not only caused by new entrants, but also by incumbents reacting to new competitors (Fritsch, 2008).

On the other hand, firm exit is associated with structural breaks like industry shakeouts (Klepper and Simons, 2006; Bhaskarabhatla and Klepper, 2009; Buenstorf and Klepper, 2010a) and all their socio-economic consequences, like unemployment, relocation, obsolete skills, obsolete organizational forms and reallocation of resources.

If individual entrepreneurs or their firms are investigated, entrepreneurial entry is connected with the creation of markets (Dew et al., 2011), the development of individual capabilities (Helfat and Lieberman, 2002), employment and productivity growth, innovation and a higher life satisfaction for the entrepreneur (van Praag and Versloot, 2007). Regarding the last point, individuals identify with their business in a similar way to parents with their children and find meaning in entrepreneurship (Cardon et al., 2005, see also Cardon et al., 2009). Despite those positive side effects, entrepreneurs on average earn less than employees (Hamilton, 2000) and positive growth and employment effects are only realized by fast growing firms but not by entrepreneurship per se (Wong et al., 2005).

In contrast with individual entrepreneurial entry, exiting a business may entail emotional costs (Gimeno et al., 1997), especially when entrepreneurs fail (Shepherd et al., 2009). Moreover, in case of entrepreneurial failure, individuals may be constrained in founding a new business and obliged to find employment. Another implication from business failure is the learning effect. Such learning includes a

broader scope of behavior, a deeper understanding of the entrepreneurial process and changes in operations (Cope, 2011). As a result of exit because of business failure, exit from a well running firm can generate liquidity for entrepreneurs, allowing them to start new ventures (DeTienne, 2010). Thus, exiting entrepreneurs may promote regional growth by reprocessing their learned abilities, social capital and financial resources (Mason and Harrison, 2006).

1.2 Thesis motivation

Despite there exists a broad knowledge about entrepreneurial entry and exit, some facets of it are sparsely investigated. In more detail, entry and exit are mostly treated as one dimensional variables. However, entry and exit decisions are rather a multidimensional phenomenon. For instance, regarding individual entrepreneurial entry, entrepreneurs may be innovative or not. Similarly, different natures of opportunities exist which entrepreneurs pursue when they start up a firm (Dosi, 1997; Buenstorf, 2007a; Dahlqvist and Wiklund, 2012). Looking at individual entrepreneurial exit, various exit reasons may exist beyond entrepreneurial failure, like retirement or problems with other founder team members (Ronstadt, 1986). Those problems are sparsely investigated.

The same logic holds true for firm entry and exit decisions too. Correspondingly, firms may enter into certain industries at specific points in time according to their capabilities (Helfat and Lieberman, 2002). Technological discontinuities may lead to the obsolescence of firm capabilities and changing entry patterns (Tushman and Anderson, 1986). But also the exit motives of firms may differ and not only hinge on a poor economic performance. A firm may exit an industry, for example, because it needs liquidity to invest in more promising industries.

Thus, treating entrepreneurial entry and exit as a one dimensional phenomenon falls short in grasping the whole picture of the effects and determinants of it. In addition, when it comes to the relationship between multidimensional entry decisions and exit, the issue of sample selection bias is widely neglected. However, if self selection is not considered in econometric analysis, estimators may be biased (Deheija and Whaba, 2002; Imbens, 2004). In turn, those drawbacks may lead to wrong implications for managers, entrepreneurs, firm stakeholders or policy makers.

In conclusion, there exists a lack of insights with respect to determinants and consequences of various modes of entrepreneurial entry and exit.

It is therefore useful to investigate entrepreneurial entry and exit while acknowledging the multidimensionality of those constructs. Consequently, this thesis sheds some light on determinants and consequences of entrepreneurial entry and exit. Moreover, entry and exit variables are treated as multidimensional constructs and self-selection bias is addressed if theory suggests endogeneity. The main questions of the thesis therefore are as follows: (1) "What determines the market novelty of entrepreneurial firms?", (2) "Is there a link between endogenous firm entry timing and firm survival in the face of technological discontinuities?", (3) "What is the link between innovation, personality and individual entrepreneurial failure?" and (4) "What is the link between personality traits and various motives of individual entrepreneurial exit?".

It is shown in the main chapters that (1) entrepreneurial entry patterns differ regarding the degree of market novelty. (2) Firm entry into industries may be dependent on endogenous entry-timing, which accords to the firm knowledge. On the other hand, firm exit is determined by the match between firm capabilities and entry timing. (3) Innovation degreases the likelihood of a particular kind of individual entrepreneurial exit, namely failure. Moreover, the relationship between innovation and failure is moderated by the personality of the lead founder. (4) Personality is related with various (non-economic) motives of individual entrepreneurial exit.

In the next section, I provide definitions of entrepreneurial entry and exit. A broad knowledge on entrepreneurial entry and exit patterns already exists, which I briefly summarize. Particularly, in Section 1.4, I discuss determinants of individual entrepreneurial entry and exit. Besides, in Section 1.5, I treat factors affecting entry and exit patterns of (entrepreneurial) firms. This part of the thesis gives a rough overview about the recent state in research on entrepreneurial entry and exit. An overview of the main chapters is provided in Section 1.6.

1.3 Definition of entrepreneurial entry and exit

In this thesis I examine entrepreneurial entry and exit from two perspectives. The first refers to entry and exit of firms into markets. Accordingly, Helfat and Lieberman (2002, p. 726) describe firm entry into a market as the "... initial

production of a product or provision of a service..." while Siegfried and Evans (1994, p. 121) define firm exit "...when it (the firm) [S.W] stops producing a product entirely or discontinues selling in a particular market."

The second perspective is given by the individual entrepreneur, which often corresponds to the firm level. Entrepreneurial entry on the individual level thus might be defined through the fact that an individual starts a business. In line with Cantner and Stützer (2010, p. 16), a business is set up "...when accounting started either because of obligations from the commercial register or because of first revenues." In contrast, individual entrepreneurial exit refers to "…the process by which the founders of privately held firms leave the firm they helped to create; thereby removing themselves…from the primary ownership and decision-making structure of the firm." (De Tienne, 2010, p. 204).

1.4 Determinants of individual entrepreneurial entry and exit

1.4.1 Determinants of individual entrepreneurial entry

With regard to the individual or team level, there is an ongoing controversy on whether entrepreneurial entry is mainly affected by individual or environmental factors (Aldrich, 1999; Shane, 2003). At the macro level, environmental circumstances like small government size and freedom from corruption foster entrepreneurial entry (Aidis et al., 2010). Moreover, taxation policies can have a considerable effect on entrepreneurial entry behavior. For instance, income tax with a convex shape reduces entrepreneurial entry rates significantly, compared with a linear tariff (Gentry and Hubbard, 2000). Other important institutional aspects which promote entrepreneurship are an entrepreneurial friendly bankruptcy law (Peng et al., 2010; Lee et al., 2010), ample borrowing constraints (Cagetti and di Nardi, 2006), a deregulated banking sector (Kerr and Nanda, 2009) and administrative simplicity (Klapper et al., 2006; Grilo and Thurik, 2009). Regional peculiarities such as entrepreneurial organizations which serve as role models or the availability of resources and appropriate networking partners may also trigger individual start-up decisions (Sorenson and Audia, 2000).

Effects of the micro environment on individual entry

At the micro level, family and educational background are essential sociological conditions backing up entrepreneurial entry decisions. Entrepreneurial

orientations are promoted if parents are self-employed, have a high occupational status, are well educated and receive high incomes. It is also shown that more schooling years relate to higher preferences for entrepreneurship (Halaby, 2003). In addition, personal wealth is linked with the decision to found a firm, or, put differently, financial constraints hamper entrepreneurial entry (Evans and Jovanovic, 1989; Blanchflower and Oswald, 1998). Other environmental circumstances, which trigger entrepreneurial activities, are employment in non-bureaucratic young firms (Dobrev and Barnett, 2005; Sørenson, 2007) small firms (Elfenbein et al., 2010) or simply unemployed (Santarelli and Vivarelli, 2007). Workplace peers likewise may have an effect on individual engagements into entrepreneurship. In this regard, Nanda and Sørenson (2010) find that co-workers who possess entrepreneurial experience serve as role models for potential entrepreneurs. But it is not only co-workers who affect entrepreneurial entry. Also the information and information potential of social networks increases the likelihood of entrepreneurial entry (De Carolis et al., 2009).

Individual peculiarities as individual entry determinants

Besides environmental factors, individual peculiarities play a role in explaining why some people become entrepreneurs and others do not. Individual factors may be broadly distinguished into personality traits and characteristic adaptations[1], which are rather cognitive in their nature (McCrea and Costa, 1999; for a general theory of personality see McAdams and Pals, 2006). Cognitive factors affecting entrepreneurial entry are, for instance, the ability to run an entrepreneurial firm, while the expectancy of the entrepreneurial outcome is less important (Townsend et al., 2010). Nevertheless, the expectancy of having sufficient capabilities for starting-up a business might be due to overconfidence instead of substantial expertise and knowledge (Koellinger et al., 2007; Santarelli and Vivarelli, 2007), although entrepreneurial human and social capital predict entry (Stam et al., 2008). Furthermore, opportunity alertness or pattern recognition are important mindsets that trigger entrepreneurial activity (Baron, 2007).

[1] Due to McAdams and Pals (2006, p. 207) "Personality traits provide a rough outline of human individuality, a first cut, a recognizable signature that a person tends to express in a range of situations (though not in all) and over a relatively long period of time (though not necessarily forever)", whereas "Characteristic adaptations include motives, goals, plans, strivings, strategies, values, virtues, schemas, self-images, mental representations of significant others, developmental tasks, and many other aspects of human individuality that speak to motivational, social-cognitive, and developmental concerns." (McAdams and Pals, 2006, p.208)

Knowledge and experience are also suggested to affect entrepreneurial entry. More precisely, managerial experience and higher education fuel the decision to set-up a firm (Kim et al., 2006). With respect to skills, a relatively balanced skill set is characteristic for entrepreneurs (Lazear, 2004). And finally, individual motivations are strongly related to the tendency for entrepreneurial entry. For instance, the need to change society or the status quo are basic motives to found new firms (Carrol and Hannan, 2000).

There is an ongoing debate about whether personality traits are related to the tendency to become an entrepreneur. This controversy is moreover linked to the question of whether broad traits, like the Big Five consisting of conscientiousness, agreeableness, openness, extraversion and neuroticism (see Costa and McCrea, 1992), or narrow traits, like Self-Efficacy (see Bandura, 1977) reveal a better predictive power (Rauch and Frese, 2007a). Recently, meta-analytical evidence suggest that firstly, personality traits have a relationship with entrepreneurial entry. Secondly, narrow traits have a higher predictive validity in explaining entrepreneurial entry, especially if the respective traits are linked to entrepreneurial task requirements (Zhao and Seibert, 2006; Rauch and Frese, 2007b).

Narrow traits which predict entrepreneurial status are the need for achievement, self-efficacy, innovativeness, stress tolerance, the need for autonomy, and proactive personality (Rauch and Frese, 2007b). Moreover, entrepreneurs have a higher risk propensity than managers (Stewart and Roth, 2001). Among the Big Five personality traits, compared to managers, entrepreneurs score higher in conscientiousness and openness, but lower in neuroticism and agreeableness (Zhao and Seibert, 2006).

The relationship between innate personality traits and entrepreneurial activity suggests that genetic factors may play a role in the question of why some people engage in entrepreneurship and others do not. Twin studies indeed imply that entrepreneurial entry is at least in part genetically determined (Nicolaou et al., 2008). Similarly, employees who have a predisposition for working in the public sector are less likely to become entrepreneurs. On the other hand, people with a predisposition for entrepreneurship are more likely to leave the public sector for entrepreneurship compared to workers predisposed to be public sector employees (Özcan and Reichstein, 2009).

Future research directions concerning individual entrepreneurial entry

decisions are moderators and mediators which affect the personality entrepreneurial status relationship (Zhao and Seibert, 2006). For instance, a recent study shows that the risk propensity entrepreneurial status relationship is mediated by rule breaking behavior in adolescence (Zhang and Arvey, 2009). Moreover, relatively little evidence exists regarding the relationship between individual factors and the nature of opportunities which entrepreneurs pursue (Dahlqvist and Wiklund, 2012).

In particular, determinants of the market novelty of entrepreneurial firms are sparsely investigated and thus chapter 2 of the present thesis addresses this issue.

1.4.2 Determinants of individual entrepreneurial exit

At the individual level, research on entrepreneurial exit is scarce (DeTienne and Cardon, 2010). A controversial issue in entrepreneurship research concerns the question of whether entrepreneurial exits are mainly driven by economic considerations. Gimeno et al. (1997)'s model suggests that entrepreneurial exit decisions are determined by both a poor economic venture performance and a low psychic income from entrepreneurship. The chapters 4 and 5 deal with this topic.

Non economic reasons for individual exits

Empirical evidence shows that one third of all business are closed while they can be categorized as economically successful. The reasons for successful closure are given with better job opportunities outside of the business (Headd, 2003; DeTienne, 2010). Additionally, personal problems with the family, health problems, time constraints or legal issues may lead to "successful" entrepreneurial exit (Ronstadt, 1986). Likewise, risk aversion, pension without a succession, friction in management or death are other reasons why economically successful entrepreneurs exit (Egeln et al., 2010; DeTienne, 2010). Entrepreneurial exit can be considered as a strategic choice. Put differently, some entrepreneurs start-up in order to sell their firms with high profits through an IPO or acquisition (DeTienne and Cardon, 2010; DeTienne, 2010; Wennberg et al., 2010).

Empirical studies of successful entrepreneurial exit underline the importance of entrepreneurial experience, age and education (Wennberg et al., 2010, see also De Tienne and Cardon, 2010).

Individual exit because of a poor firm performance

Despite the fact that entrepreneurs leave successful firms, a main reason for an

entrepreneurial exit is poor economic firm performance. Reasons for entrepreneurial failure are manifold. In general, new firms suffer from their liability of newness (Stinchcombe, 1965). Liability of newness is manifested in production uncertainty, uncertainty in management and customer ignorance (Shepherd et al., 2000). Beyond liability of newness, entrepreneurs may fail because of high levels of competition, depreciation of debt claims, cost shocks, economic downturns and friction within the management team (Egeln et al., 2010).

1.5 Determinants of entrepreneurial entry and exit at the firm level

1.5.1 Entrepreneurial entry from a firm level perspective

In this section, the determinants of firm entry are discussed. In chapter 3 this topic is picked up again. In comparison to entrepreneurial entry at the individual level, firm entry into a market is not necessarily equal with starting up a new firm (Buenstorf, 2007a). For example, established firms may diversify out of their ancestral industries into other markets or industries (Helfat and Lieberman, 2002). Likewise as at the individual level, firm entry decisions are influenced by environmental factors and firm level determinants.

Environmental aspects of firm entry

Environmental conditions in the target market affect firm entry. For instance, growing markets promise firm success and therefore firm entry is more likely (Schwalbach, 1987; Siegfried and Evans, 1994). But not only growing markets increase the incentive to enter. Even technological opportunities, like a growing field of applicability pave the road to entry (Utterback and Suarez, 1993). Similarly, if the expected rate of return in a market is relatively high then firm entry is more likely (Schwalbach, 1987). Industry R&D intensity, industry capital intensity and market concentration serve as entry barriers especially for small firms. Moreover, small firm entry is hampered when industries are dominated by powerful unions and economies of scale (Acs and Audretsch, 1989). In general, firm entry rates are strongly correlated with exit rates (Geroski, 1995). Interestingly, even competition within local financial markets may have an effect on firm entry through the availability of financial resources (Cetorelli and Strahan, 2006).

Firm heterogeneity as an entry determinant

Besides environmental circumstances, firm heterogeneity is a crucial cause of entry. In this vein, Helfat and Lieberman (2002) claim that entry is determined by a firm's pre-entry endowment with capabilities and resources. Hence, the more a firm's qualities are linked with requirements of the target industry, the higher the likelihood of entry. In case firms possess an excess of financial resources, entry into unrelated industries becomes more likely (Chatterjee and Wernerfelt, 1991). However, a peculiar resource base can also hamper entry. Accordingly, the threat of challenging a well established brand or the necessity to build up new capabilities may affect decisions to diversify (Helfat and Lieberman, 2002). Another influential factor on entry are high sunk costs of capital goods (Mata, 1993). Finally, a product innovation strategy has the potential to overcome scale disadvantages of small firms, which then encourage entering decisions (Acs and Audretsch, 1989).

1.5.2 Entrepreneurial exit from a firm level perspective

Two prominent reasons exist why firms exit industries (Cefis and Marsili, 2006). One is the discrepancy between firm size and the industry specific efficient scale economies (Audretsch, 1997). However, knowledge and resource heterogeneity among firms is the most prominent cause of exits (Klepper and Graddy, 1990; Loasby, 1999; Klepper and Simons, 2000; Malerba, 2006). Knowledge differences are more crucial than in non-innovative industries than in highly innovative industries (Audretsch and Mahmood, 1993).

Firm heterogeneity and exit: pre-entry experience

Firms with a broader capability and resource base are less likely to fail. Appropriate capabilities that encourage firm entry are usually also helpful in avoiding firm exit. Related and relevant firm capabilities are crucial when radical technological changes occur. Nonetheless, incumbent market leader are often locked-in by their existing knowledge base if radical innovations emerge. Thus, they are forced to exit. Blindness about existing knowledge gaps induced by past success is one significant reason for this phenomenon. It should be noted that in new industries in which uncertainty is high, relevant capabilities and resources are more difficult to predict (Helfat and Lieberman, 2002).

In an empirical study, pre-entry experience measured in an experienced labor

force is beneficial for firm survival (Dahl and Reichstein, 2007). Cross sectional evidence on pre-entry experience and firm survival is scarce, however. Most evidence about pre-entry experience and survival stems from narrowly defined industries, which are treated in the next section. This evidence shows that pre-entry experience is an important aspect of firm survival.

Firm heterogeneity and exit: post-entry experience

Despite the impact of pre-entry capabilities and resources, even post-entry experience is related to a firm's survival. Agarwal and Gort (2002) identify two kinds of crucial post-entry knowledge. The first knowledge type was originally identified by Jovanovic (1982) and concerns passive learning about the firms' own capabilities in the respective market contexts. Besides passive learning, firms build up post-entry knowledge through active learning. Active learning involves knowledge accumulation through R&D and experiences with customers, production processes or competitors (see Pakes and Ericson, 1998). Furthermore, post-entry knowledge may even stem from mergers and acquisitions (Agarwal and Gort, 2002).

Empirical studies of the post-entry experience firm survival relationship are ambiguous. Some studies posit a positive relationship (see eg. Mata and Portugal, 1994; Agarwal, 1997; Cefis and Marsili, 2005; Geroski et al., 2010), while others do not (see Harhoff et al., 1998). Additionally, in a study of cross-country differences in the post-entry experience exit relationship, Bartelsman et al. (2005) find varying effects. However, those contradictions may have their origin in other factors that interact with a firm's age. For instance, firm size, entry mode (Hannan et al., 1998), radical innovative changes, (see Tushman and Anderson, 1986) or differing market and institutional conditions may affect the firm age survival relationship.

Firm heterogeneity and exit: innovations

Innovations are another essential source of firm heterogeneity which affect firm survival (Utterback and Suarez, 1993; Jovanovic and MacDonald, 1994; Klepper, 1996). The reasons why innovations are beneficial for firm survival are manifold. They establish monopolies which assure above average profits (Schumpeter, 1911) and thus may work against firm exits. Unique assets built up through innovations are hard to copy and create competitive advantages (Teece et al., 1997). Furthermore, after radical technological changes and the emergence of new market segments, innovative activities help to adjust or shape a new paradigm, which in turn ensures firm survival (Christensen et al., 1998). Finally, for industry

incumbents it is imperative to introduce incremental product innovations in order to increase market shares and survival chances (Banbury and Mitchell, 1995).

Empirical studies corroborate the above suggestions. As the meta-analysis of Rosenbusch et al. (2011) indicates that innovativeness increases the performance in SMEs, it is not surprising that, especially for small firms, innovativeness is seen as a way of preventing exits (Audretsch, 1991). Moreover, innovativeness is linked to firm survival in Dutch manufacturing firms in general (Cefis and Marsili, 2005), and this effect increases over time (Cefis and Marsili, 2006).

1.5.3 Entrepreneurial entry and exit throughout the industry life cycle

The above discussion has mainly concentrated on cross sectional entrepreneurial entry and exit determinants. Industrial dynamics research puts the idea that entry and exit patterns change over the evolution of industries center stage. The seminal work of Gort and Klepper (1982) describes the archetypical development of the number of firms within an industry as an inverted-U-shape. In the first stage of the industry life-cycle[2], a surge of entry takes place and the number of producers rises. In this phase, many product versions exist, the product innovation rate is high and the market leadership is unstable. The second stage is exemplified by a drop in firm entry and a strong increase in firm exits. This pattern is also described as a shakeout. Structurally, at this stage, the product design stabilizes and the rate of product innovation decreases, while process innovations become more and more prevalent. Furthermore, the market shares of incumbent firms stabilize. Finally, at the third stage, industries are dominated by a small but stable number of producers, which produce a highly standardized product on a large scale (Klepper and Graddy, 1990; Klepper, 1996; Klepper, 1997).

There are three main approaches that explain the above described life-cycle pattern, namely Evolutionary Economics, Technology Management and Organizational Ecology (Agarwal et al., 2002).

Evolutionary Economics

Models developed under the Evolutionary Economics paradigm stress the importance of innovations, firm capabilities and accumulated knowledge for the

[2] In the introduction of this thesis it is distinguished between three different life cycle stages, whereas originally Gort and Klepper (1982) figure out five.

interrelationship of industrial dynamics and firm survival. Prominent models from this branch were constructed by Klepper (1996; 2002) Klepper and Thompson (2006) and Bhaskarabhatla and Klepper (2009). Klepper (1996) proposes that the early entrants that best perform product innovations attract comparably more customers in the early stages of the industry. In later stages of the industry life-cycle, process innovations remunerate the scale advantages of those early performers through higher overall cost-reductions and force firms with a lower scale to exit and deter potential entry. An alternative to this model introduced by Klepper (2002) brings a firms' pre-entry experience center stage. Experience is then assumed to increase the efficiency of how the process of R&D is performed. Again, earlier entrants with experience which more efficiently decreases their costs through the R&D process benefit as a result of scale advantages in the later stages of industry evolution. As a consequence, those firms outperform inexperienced early entrants and experienced as well as inexperienced later entrants.

However, not all industries pass through a shakeout (Gort and Klepper, 1982; Klepper, 1997), as in the German machine tool industry (see Buenstorf and Guenter, 2011), or the shakeout follows a comparatively long period of growth in the number of producers, as in the US laser industry (see Bhaskarabhatla and Klepper, 2009). Also, the above described first mover advantages are not always observable (Tushman and Anderson, 1986; Olleros, 1986; Christensen, 1993; Buenstorf, 2007b). The common explanation in Evolutionary Economics for such departures is the emergence of new submarkets, which encourage new firm entries. If the economies of scope do not effectively serve heterogeneous demands and technological requirements within a broader product class, the shakeout may not occur (Klepper and Thompson, 2006; Buenstorf, 2007b; Bhaskarabhatla and Klepper, 2009). Several submarkets may then simultaneously or subsequently exist (Windrum, 2005).

The disappearance of first mover advantages and shakeouts is reasoned by the emergence of new submarkets, which gain dominance (Klepper and Thompson, 2006; Bhaskarabhatla and Klepper, 2009). Firm survival in this framework is similarly explained as in the above introduced models due to Klepper (1996; 2002). Early entering product innovators outperform other entrants through process R&D and scale advantages within dominance gaining submarkets (Bhaskarabhatla and Klepper, 2009).

Technology Management

Closely related to the concept of submarket emergence, the Technology Management approach ascribes the entry and exit behavior of entrepreneurs to socioeconomic factors, organizational behavior and technological phases (Agarwal et al., 2002). Accordingly, industrial evolution is characterized by incremental technological advancement and technological discontinuities. Technological discontinuities hence correspond to major breakthroughs induced by product or process innovations. Those breakthroughs are competence enhancing or competence destroying for (potential) entrants and industry incumbents. Competence enhancing discontinuities represent significant product or process improvements within a segment, which are in concert with existing accumulated individual and organizational capabilities, knowledge and resources of incumbents or potential entrants. In contrast, competence destroying discontinuities render existing accumulated competencies and resources of industry incumbents or (potential) entrants obsolete. In-between technological discontinuities, marginal technological progress mainly concentrates on efficiency gains (Abernathy and Clark, 1985; Tushman and Anderson, 1986).

Subsequent to technological discontinuities, competition for a dominant design ignites entry and an ample variation in product designs. The dominant design then gradually becomes visible as a result of customer preferences, feasibility or political interventions. After the stabilization of the dominant design, industry incumbents compete for the efficient provision of the product (Anderson and Tushman, 1990). The selection process resulting in industry shakeouts hinges on the ability of producers to adjust to the dominant design. Adjustment is more likely if firms possess capabilities and resources, which allow them to streamline their processes and organization in order to provide the dominant design more efficiently. Firms which are not able to deliver products embodying the dominant design tend to exit. Furthermore, entry drops because market experimentation is restricted and entry with product innovation is not promising (Utterback and Suarez, 1993).

The idea that a major technological breakthrough triggers the industrial life-cycle pattern is formalized by Jovanovic and MacDonald (1994). The authors assume that equally capable firms need to innovate in order to enter into a market. In the second period of the model, firms face a major product invention. In case firms randomly innovate on the fundament of this invention, they can extent their output

and revenues. Non-innovative firms are disadvantaged as the increasing market volume decreases the product price, while fix-costs have to be financed. In conclusion, firms which innovate quickly and adjust to the external technological shock are not sorted out by the market and survive the shakeout. However, despite the fact that this model explains industry shakeouts with the help of technological developments, firm adjustments are assumed to be random.

Organization Ecology

The third explanation for the industry life-cycle pattern is Organization Ecology. In this paradigm, the number of firms in a market causes the industry life-cycle. The industry shakeout is reasoned with firm peculiarities, which are imprinted when firms enter into an industry (Carroll and Hannan, 1989; Carroll, 1997; Carroll and Hannan, 2000). When a new industry is initiated, organizations usually lack legitimacy. Consequently, the more organizations are involved in a market, the higher the entering firm's legitimacy. Market entry is determined by the degree of legitimacy divided by the level of market competition. Competition thus serves as an entry barrier. Legitimacy and competition are hence dependent on the level of market density, which is defined as the number of firms in a market. The effect of legitimacy and competition on entry is modeled so that the relationship between entry rate and the number of firms in a market has an inverted-U-shape. On the other hand, a firms' mortality rate is proportional to competition and is conversely proportional to legitimacy. This results in a U-shaped relationship between density and exit. In spite of the formal attractiveness of this model, it does not predict the industry shakeout is not predicted. Market density in this set-up oscillates narrowly around the peak and no shakeout occurs (Carroll and Hannan, 1989; see also Carroll, 1997).

Hence, several explanations linked with organizational endowments are provided in order to explain the archetypical industry life-cycle model. In the "liability of resource scarcity" rational, limited firm resources at high degrees of market density account for shakeouts. Therefore, if organizations enter into industries with high levels of competition they will face resource scarcities. Thus, when high market densities prevail, firms struggle to build up sustainable structures, processes and institutions. In turn, in case those firms survive, they face higher exit hazards at every stage, which leads to density delay.

Another explanation for density delay is "tight niche packing". Accordingly, if many firms are in a market, only a small amount of opportunities remain

unfulfilled. Especially highly competitive markets leave only mediocre market segments to entrants, as the most profitable resources are already exploited by established incumbents. In the long run, switching from niches to more prolific opportunities demands substantial investment. Entry during a phase with high market density thus results in higher exit hazards at all stages and corresponds to density delay.

Finally, the "trial by fire" explanation links firm hazard rates with competitive selection forces. Certain firms are frailer than others and thus more likely to exit. In highly competitive environments, frailer firms are more likely to be forced to exit in comparison with more friendly circumstances. Entry cohorts exposed to higher densities therefore consist in later stages of comparably less frail firms. In conclusion, the "trial by fire" approach explains industry shakeouts with higher mortality rates of frail firms at times when high market densities prevail (Carroll and Hannan, 1989).

While much of the literature focuses on the entry and exit behavior of entrepreneurial firms, studies of individual entrepreneurial entry and exit over the industry life-cycle remain scarce. However, Buenstorf (2007a) concludes that investigating the interrelationship between individual entrepreneurial entry and industry evolution is a promising field of research. In more detail, with regard to the evolution of industries, differing entrepreneurial entry behaviors or determinants of entry may be observed. For instance, entrepreneurs who establish entirely new markets or industries cannot draw on existing organizational forms but have to create them from scratch (Alvarez et al., 2010). Moreover, individual entry into established industries is more likely with the possession of industry related knowledge. In contrast, profound industry related knowledge is detrimental to the creation of entirely new industries (Aldrich and Kenworthy, 1999).

Even though some theoretical foundations of the relationship between individual entrepreneurial characteristics and industry evolution exist, little empirical evidence on this topic is available. Similarly, the linkage between individual entrepreneurial exit decisions and industry evolution is not well understood.

1.6 Thesis composition and chapter summary

The discussion in the above sections concentrates on general patterns of

entrepreneurial entry and exit decisions. While Chapter 2 differentiates between varying entry conditions, Chapter 3 treats the link between entry timing and firm exits over the industry life-cycle in German farm tractors. Chapters 4 and 5 deal with the divergent exit reasons of start-up entrepreneurs. Chapter 3 investigates entrepreneurial firms as units of observation. In contrast, the Chapters 2, 4 and 5 focus on individual entrepreneurs.

The link between Chapters 2-5 is the phenomenon of different facets of entrepreneurial entry and exit. Additionally, in Chapters 2, 4 and 5, data from the Thuringian Founder Study is employed. This is a dataset consisting of highly innovative entrepreneurs from the German Federal State of Thuringia (see Section 2.5.1 for a detailed overview). The data on German farm tractor producers from 1896 till 2007 utilized in Chapter 3 was collected by the author of this thesis (see Section 3.4. for a detailed overview).

The following four chapters are founded on research papers which have been presented on workshops of the DFG research training group "The Economics of Innovative Change" and several international conferences.[3] Chapters 2, 3 and 4 are co-authored work. Chapter 2 was written with Prof. Dr. Uwe Cantner and Dr. Maximilian Göthner. Chapter 3 is a collaborative work with Prof. Dr. Guido Bünstorf and Dr. Christina Günther. Chapter 4 is jointly written with Prof. Dr. Uwe Cantner and Prof. Dr. Rainer K. Silbereisen. In all of the co-authored chapters, each of the authors contributed equally to the work.

In the following subsections, the main chapters of the thesis are summarized in order to provide a brief overview.

1.6.1 Determinants of market novelty of entrepreneurial firms

The next chapter concerns entrepreneurial entry. Research into the nature of the opportunities which entrepreneurs pursue when they found a business is scarce (Dalqvist and Wiklund, 2012). We can use the concept of market novelty to assess

[3] The papers were presented at the 2012 EARIE Conference (Rome, Italy, 2nd-4th September), the 2012 Schumpeter Society Conference (Brisbane, Australia, 2nd-5th July), the 2012 DRUID Conference (Copenhagen, Denmark, 19th-21st January), the 2012 IECER Conference (Regensburg, Germany, 15th-17th February), the 2012 DRUID Academy Winter Conference (Cambridge, United Kingdom, 18th-21st January), the 2011 RENT Conference (Bodo, Norway, 16th-18th November), the 2011 DIME Final Conference (Maastricht, Netherlands, 6th-8th April), the 2011 DRUID Academy Winter Conference (Aalborg, Denmark, 20t-22th January) and the 2010 EEFS Conference (Athens, Greece, 3th-6th June).

the nature of opportunities. Moreover, we develop a theoretical framework which integrates the concepts of opportunity creation and discovery within an evolutionary market perspective. Accordingly, opportunity creation mainly takes place when markets are characterized by a high degree of novelty. If markets are in rather a mature state, opportunity discovery is suggested to be the prevailing foundation of entrepreneurial behavior.

We examine the relationship between entrepreneurial characteristics and the degree of market novelty of their firms. The dataset which is utilized to check our hypotheses was provided by the Thuringian Founder Study. This consists of entrepreneurs who started up in the German Federal State of Thuringia. All of the entrepreneurs in the employed dataset started up in industries in which, on average, more than 3.5% of the turnover is spent on R&D. With regard to missing data, we can draw on 469 observations. Market novelty is measured in terms of 4 Items. We will use a quantile regression approach, as the distribution of market novelty is skewed in our sample.

Generally, industry related experience is hypothesized as diminishing the degree of market novelty. Our findings indicate that this suggestion holds true. The expectation that entrepreneurial experience increases market novelty is not supported by our data. In contrast, we find that an entrepreneurial personality profile of the lead founder increases the market novelty of their firms. This result, however, only holds true at the upper quantiles of market novelty. Thus, we show that for entrepreneurship with a high degree of market novelty, personality plays a considerable role. Nevertheless, in case of a low degree of market novelty, the effect of personality becomes insignificant. Innovations are important for market evolution. Thus we also test the relationship between innovation strategy and market novelty. The findings indicate that entrepreneurial firms with a sole product innovation strategy have a higher degree of market novelty. On the other hand, a sole process or non-innovation strategy leads to a lower degree of market novelty. The comparison group consists of entrepreneurial firms with a product as well as process innovation strategy.

1.6.2 Technological discontinuities, endogenous entry timing and firm performance [4]

The question of how firm capabilities ensure firm survival over the course of industry evolution has still not been finally answered. There is an ongoing debate about whether first mover or late comer advantages pay for firm survival. In this regard, in Chapter 3 the proposition of Helfat and Lieberman (2002) regarding the relationship between firm capabilities, entry timing and firm survival is investigated. More precisely, the study probes the effect of pre-entry experience on firm survival in the presence of technological discontinuities (see Tushman and Anderson, 1986). Accordingly, we argue that it is not first mover or latecomer advantages that explain firm survival, but the "right" entry timing regarding firm capabilities. As a case study we focus on the German farm tractor industry.

In the German farm tractor industry, motor plows designed for large scale croplands have dominated the market. However, through several major design innovations and the abolition of large East German croplands as an effect of World War I, a new submarket gained dominance around 1927. The multipurpose small scale farm tractor started its triumphal progress mainly in Southern Germany and crucially forced the mechanization of German agriculture. We use this example of the emergence of a dominance gaining submarket in order to test our hypotheses. Altogether we identify the pre-entry experience of 246 German farm tractor producers from the inception of the industry in 1896 until 2007.

We found that firm entry behavior is endogenous. Thus, after the emergence of the new submarket, mainly producers from Southern Germany with pre-entry experience in agricultural implements production entered the market. In the Southern German area, agriculture was hardly mechanized before 1927. On the other hand, after controlling for endogenous entry through propensity score weighting, we find that even those producers performed better after the emergence of the new submarket. Moreover, after taking account of endogenous entry behavior, cohort effects disappeared. Consequently, this study shows that first mover or latecomer advantages may not always be decisive for industry dynamics, but that matching firm capabilities and resources with market requirements is very important.

[4] A presentation of an earlier paper version of this chapter at the EARIE 2012 Conference in Rome, Italy, was granted with the Presentation Award of the Verein für Socialpolitik (sponsored by Schweizerische Nationalbank).

1.6.3 Innovation, personality traits and entrepreneurial failure

Chapter 4 deals with innovation and entrepreneurial failure. Studies on entrepreneurial failure are rare (Cardon et al., 2011). In general, entrepreneurial failure is attributed to firm external factors, like industry cost or revenue shocks, or firm internal factors, like the human capital (Hall, 1992; Everett and Watson, 1998; Watson and Everett, 1999). The relationship between innovation and entrepreneurial failure is not well investigated. However, the answer to the question whether an innovation strategy is promising for starting-up entrepreneurs or not has important implications for entrepreneurs and policy makers. Consequently, the relationship between innovation and failure is of interest for research, entrepreneurs and policy makers. On the other hand, some studies suggest that the personality of entrepreneurs may have an effect on the effectual implementation of innovations (Rank et al., 2004; Bledow et al., 2009). As a personality measure we utilize the Big Five given by extraversion, neuroticism, agreeableness, openness and conscientiousness (Digman, 1990). Some theoretical studies suggest that extraversion and conscientiousness strengthen, while openness weakens the negative effect of innovation on entrepreneurial failure. Consequently, the research questions of this study are (1) "Which effect has innovation on entrepreneurial failure if observed endogeneity is considered?" (2) "Which Big-Five personality traits moderate the effect of innovation on entrepreneurial failure?"

The data which we use to answer our research question stems from the Thuringian Founder Survey, which is briefly described above. With the help of the dataset, we assess the Big Five personality traits of the investigated entrepreneurs and whether they introduced an innovation while starting up. In order to address the issue of sample selection bias into innovative business venturing, we employ stratification on the propensity to innovate (Rosenbaum and Rubin, 1984; Stukel et al., 2007) in combination with a Cox regression.

We refer to failure if an entrepreneur exits his firm because of economic reasons. With the purpose in mind to assess failure adequately, we utilize Gaskill and Van Auken (1993, p. 21) definition of business failure as "…wanting or needing to sell or liquidate to avoid losses or to pay off creditors or general inability to make a profitable go of the business". Correspondingly, from the 425 firms in our data we identified 98 entrepreneurial exits. We also figure out which of the 98 entrepreneurial exits are due to economic reasons. In accordance with the definition of

entrepreneurial failure, we classified entrepreneurial exits as failure, either if (1) the left firms went bankrupt (external data), (2) the entrepreneur exited because he or she "lost too much money" (self-report) or (3) "an inability to make a go of the business" (self-report).

Our findings suggest that external cost and revenue shocks have an effect on entrepreneurial failure. Also, if sample selection bias is considered, we find that innovation negatively relates to entrepreneurial failure, which accords to our hypothesis. Likewise, our results indicate that personality moderates the effect of innovation on entrepreneurial failure. In more detail, extraversion strengthens the negative effect of innovation on failure. In contrast, both, openness and conscientiousness weaken the negative effect of innovation on entrepreneurial failure. While the first two effects are in line with our hypotheses, the latter contrasts our expectations.

In summary, innovation seems to be a promising strategic choice to avoid entrepreneurial failure. Moreover, the personality of entrepreneurs moderates the negative effect of innovation on entrepreneurial failure.

1.6.4 For whom the bell tolls – personality and various motives of entrepreneurial exit[5]

Entrepreneurial exit is widely understudied (DeTienne and Cardon 2010), especially in highly innovative environments. Chapter 5 deals with various reasons of entrepreneurial exit. In particular, research into entrepreneurial exits mainly recognizes economic factors that determine exit decisions (see Wennberg et al. 2010). However, as Gimeno et al. (1997) claim, entrepreneurs partly at least rely on their psychological income when it comes to exit decisions, and even non economic forces may lead to exits. These non-economic factors, such as relationships and emotional health, are may be useful to investigate (Cardon et al. 2005, DeTienne and Cardon 2010), because entrepreneurial exit has a strong impact on the entrepreneur, the firm, industry dynamics and the whole economy through the reallocation of resources (DeTienne 2010). Also, entrepreneurs with certain qualities design their firms and their firms' environments (Sarasvathy 2004), which may have an impact on

[5] An earlier paper version of this chapter was granted with the „Bent Dalum PhD Award" in the context of the 2012 DRUID Academy Conference in Cambridge, United Kingdom, for the most promising and innovative research project.

their propensity to exit. But what are these factors? One very promising approach to explain entrepreneurial exit are the Big Five personality traits, consisting of conscientiousness, extraversion, agreeableness, openness and neuroticism (Digman 1990). So far, no study links the Big Five to various exit motives, which are in part based on non-economic factors. Therefore in this paper I pose the question: "Are the Big Five personality traits differently related to various entrepreneurial exit motives in highly innovative industries?"

In order to answer my research question, I use data from the Thuringian Founder Survey consisting of 423 entrepreneurs from the German federal state of Thuringia. This survey is an interdisciplinary project on the success and failure of team- or solo-entrepreneurs in the East German state of Thuringia. The entrepreneurs that are investigated in this study operate in innovative industries according to Centre for European Research (ZEW) classification "advanced technology" and "technology-oriented services" (Grupp and Legler 2000). 98 of the 423 (co-) founders ceased their entrepreneurial activity. From these 98 discontinuances, I could also identify four specific reasons for discontinuance. Multivariate Cox-regressions (Wei, Lin and Weissfeld 1989) are employed to trace the possible link between the entrepreneur's Big Five personality traits and the three above introduced reasons to exit, namely (1) overinvestment of personal resources, (2) low job satisfaction, and (3) problems with other team members, given a founder team exists, and (4) other reasons with the help of a competing risks framework.

In contrast with my hypothesis, I find no relationship between neuroticism and exit due to overinvestment. Moreover, exit because of problems with other founder team members negatively relate to agreeableness. Finally, I find that exit due to job dissatisfaction positively relates to extraversion and neuroticism, while it negatively relates to agreeableness.

The results imply that entrepreneurial exit is not only affected by economic considerations, but also by other motives, such as well being, relationships and risk taking preferences. Viewing strategic exit decisions only from the point of economic firm performance may hence fall short of tackling the issue of entrepreneurial exit. This finding suggests that psychological income may play an important role in entrepreneurial exit decisions, as proposed by Gimeno et al. (1997). As a consequence, individual differences in explaining entrepreneurial exit decisions are not only related to human capital, opportunities or demographic factors (see

Wennberg et al. 2010), but also by the personality of entrepreneurs. In conclusion, investigating factors that affect various exit motives might be a more fruitful approach to understanding exit decisions than only consider exit as a one dimensional phenomenon.

2 Chapter: Determinants of market novelty of entrepreneurial firms

2.1 Introduction

According to Schumpeter (2002), entrepreneurs are agents of economic change who, through setting up new business ventures, create "something not yet being created on a regular basis in the static state of the economy" (pp. 409-410). In doing so, entrepreneurs contribute to the emergence and evolution of new markets (Metcalfe et al., 2006). If new markets are seen as the seed of individual firms, rather than the whole social construction of institutional relationships and boundaries (see Fligstein, 2001), contrasting views exist about how entrepreneurship is related to market novelty.

In general, market novelty mirrors the nature of opportunities entrepreneurs pursue (Dosi, 1997; Buenstorf, 2007; Dahlqvist and Wiklund, 2012). We define an opportunity in the following according to Alvarez et al. (2010, p. 25) as "…a market imperfection." While some authors link the emergence of novel markets with the discovery and exploitation of previously untapped, yet already existing, entrepreneurial opportunities (Dahlqvist and Wiklund, 2012), others claim that new markets are set up as a result of entrepreneurial action upon newly created opportunities (Sarasvathy and Dew, 2005; Alvarez and Barney, 2007; Dew et al. 2011). Finally, a third view exists that integrates both creation and discovery of entrepreneurial opportunities into an *evolutionary framework of market development.* In more detail, in this approach opportunities are always created to some extent by entrepreneurs but are experimented against an intersubjective reality, namely by the market demand. Thus, in the latter sense, opportunities are also discovered and objective (Buenstorf, 2007; Alvarez et al., 2010; Alvarez et al., 2012). Correspondingly, the more a market matures, the more opportunities become objective, which for instance may crystallize in a dominant design (Geroski, 2003).

Drawing on established research in economics (Williamson, 1975; Gort and Klepper, 1982; Jovanovic, 1982; Jovanovic and MacDonald, 1994; Klepper, 1997; Pakes and Ericson, 1998; Geroski, 2003), as well as on management (Agarwal et al., 2002; Agarwal and Bayus, 2002) and organizational studies (Carroll and Hannan, 1989; Carroll, 1997; Carroll and Hannan, 2000), we use the *evolutionary framework of market development* in order to relate the concept of market novelty to the nature

of opportunities entrepreneurs pursue. We therefore propose that in emerging markets creational efforts to exploit entrepreneurial opportunities are prevailing. As markets mature, opportunity discovery within existing markets becomes the basis for entrepreneurial behavior. Put differently, in case of high market novelty, opportunities are more likely to be created based on knowledge outside of markets. On the other hand, in established markets (i.e., low market novelty), opportunities are more likely to be exploited with the help of actual market knowledge (see Buenstorf, 2007; Alvarez et al., 2010; Alvarez et al., 2012).

Previous research on market newness of new ventures (i.e., Dahlqvist & Wiklund, 2012; Grégoire & Shepherd, 2012) focuses on the discovery of entrepreneurial opportunities but disregards theories on opportunity creation. Furthermore, market novelty is defined in terms of geographic expansion of markets rather than from a process perspective of market development. Against this backdrop, previous literature is only able to provide a limited understanding of the determinants of strategic entrepreneurial choices in the context of new business creation. An evolutionary market perspective however, allows for predictions about the innovation behavior of entrepreneurs across different stages of market development (Utterback and Abernathy, 1975), a topic which is not yet well understood (Dahlqvist and Wiklund, 2012).

This paper applies the evolutionary market development perspective to better understand "when and how opportunities are found and created" (Short et al., 2010, p. 54). In particular, we propose that the newness of markets which entrepreneurs enter mirrors the nature of opportunities they pursue. We develop and empirically test a model of individual and firm-level determinants of market novelty in new ventures on the basis of opportunity creation and discovery. Using a dataset of 455 German start-ups, our results suggest that the emergence of new markets is an endogenous phenomenon driven by entrepreneurs and that an evolutionary economics perspective on opportunity formation might be a promising field for future research.

The rest of the paper is organized as follows. In the next section we discuss the concept of market evolution as a nexus of market novelty and maturity. Section 2.3 focuses on the relationship between entrepreneurial characteristics and market novelty. Section 2.4 introduces our dataset and empirical strategy. Our results are presented in Section 2.5. The paper concludes with a discussion of our results.

2.2 The evolution of markets and entrepreneurial opportunities

2.2.1 Market evolution and entrepreneurship

Entrepreneurship can be defined as the "nexus between enterprising individuals and valuable opportunities" (Shane, 2003, p. 9). Entrepreneurship research so far pays little attention to the nature of opportunities entrepreneurs exploit (Grégoire and Shepherd, 2012). In this respect, there is an ongoing controversy over whether market novelty is represented through opportunity *discovery* or opportunity *creation* (Sarasvathy and Dew, 2005; Alvarez and Barney, 2007; Short et al., 2010; Dew et al. 2011). Some scholars suggest that the nature of opportunities changes with the evolution of markets (Dosi, 1997; Klepper, 1997; Buenstorf 2007; Alvarez et al., 2010). Moreover, entrepreneurial opportunities have their origin either *within* or *outside* existing markets (Buenstorf 2007; Alvarez et al., 2010). On the other hand, from an evolutionary perspective[6], markets not only function as an institution coordinating competition and product allocation, but they are also seen as a process. Here, the development of markets can be categorized into different phases with corresponding characteristics (Williamson, 1975; Dosi, 1982; Gort and Klepper, 1982; Klepper, 1997; Geroski, 2003; Buenstorf, 2007).

Thus, we suggest that novel markets are shaped by entrepreneurs who create opportunities. In contrast, when markets gain maturity, opportunity discovery within an established market becomes the prevalent entrepreneurial behavior. Consequently, akin to Gruber et al. (2008), we assume that there exists a continuum describing the opportunities that are pursued by entrepreneurs through founding a new venture. This continuum ranges from (co-)creating novel markets by creating opportunities (high market novelty) through starting-up in established markets and discovering opportunities (low market novelty).

In the following, the archetypical and contrasting types of enterprising behavior, opportunity creation and discovery, are introduced and linked with the evolution of markets. This characterization is important, as it allows the drawing of conclusions about entrepreneurial determinants of market novelty.

[6] For an overview of the theoretical implications of evolutionary economics see Dosi (1997) and Witt (2003).

2.2.2 High market novelty: opportunity creation

An established, though not generalizable pattern of the evolutionary process of market development views the birth point of a market at the time of the first commercial introduction of a new product. This might be fulfilled through one or even several firms simultaneously (Williamson, 1975; Gort and Klepper, 1982; Klepper, 1997). The initiation is followed by a second stage of market evolution which entails a surge of firm entry into the newly established market. In these first two stages, new entrants compete through different product set-ups, introducing product innovations into the young industry. At this point, product output grows, uncertainty is high, production methods are unspecialized and the product design is simple (Gort and Klepper, 1982; Malerba and Orsenigo, 1995; Klepper, 1997; Agarwal, 1998).

From the viewpoint of the entrepreneur, novel markets are shaped by opportunity creation instead of opportunity discovery. The role of entrepreneurs is acting instead of passively observing the environment (Sarasvathy, 2001; Baker and Nelson, 2005; Alvarez and Barney, 2007). The development of novel markets premises that entrepreneurs intentionally bypass the institutional status-quo and iteratively develop new solutions through a trial-and-error process (Baker and Nelson, 2005). Nevertheless, this process is not simply a randomized recombination of existing ideas, resources or processes. Rather, entrepreneurs utilize heuristics and involve other stakeholders in order to reduce complexities. Hence, high market novelty is characterized by interdependent stakeholders and competitors, who bring in their characteristic preferences, values, capabilities and knowledge (Sarasvathy and Dew, 2005; Dew et al., 2011).

There is much more room in novel markets for creating than discovering opportunities. Novel markets are characterized by true uncertainty. Products are prone to error, preliminary and not coming up in an objectively accepted dominant design. Moreover, in new markets consumer needs are usually undefined (Geroski, 2003). Thus, entrepreneurs shaping novel markets encounter a future in which outcome distributions are not existent or not ascertainable at all (Dew et al., 2008; Klein, 2008). The utility of products and services develops over time through learning-by-using (Rosenberg, 1982). In that sense, objective opportunities emerge *ex-post* and are not given, as through lock in-effects even comparably inefficient solutions may become dominant (David, 1985). Thus, one may hardly argue that in

novel markets objective opportunities exist, which makes it difficult for opportunities to be discovered or ratable *ex-ante*.

2.2.3 Low market novelty: opportunity discovery

If markets mature, a drop in firm entry and an increasing number of exiting firms can be observed. Usually, the net number of firms in a market peaks at this stage. Furthermore, the tendency of firms to produce product innovations decreases as the product design stabilizes. This in turn leads to more automatized production methods. Correspondingly, process innovations become more important the more markets mature (Gort and Klepper, 1982; Klepper, 1997; Agarwal, 1998, Geroski, 2003). Finally, market development undergoes a shakeout followed by a stabilization of the number of firms in the market, often characterized by an oligopoly, strongly standardized product design, economies of scale and high entry barriers (Dosi, 1982; Gort and Klepper, 1982; Klepper, 1997, Geroski, 2003).

Within matured markets, the concept of opportunity discovery presumes that the entrepreneur is a discovering profiteer through arbitrage or scale economies. Opportunities for entrepreneurial profits emerge from market imperfections or disequilibria, which always exist because of uncertainty, bounded rationality of actors and imperfect information within existing markets. Under these circumstances, external shocks, such as technological advancements, changes in preferences or resource scarcities may also serve as a source of opportunities. Put differently, entrepreneurs act as *discoverer* of unmatched needs or imperfectly exploited left opportunities. Opportunity discovery hence serves to approach new equilibriums as an adjustment to external shocks (Kirzner, 1997; Eckhardt and Shane, 2003; Klein, 2008). However, the concept of opportunity discovery assumes that entrepreneurs are not the creators of opportunities and innovations are treated, as a driver of market novelty, exogenous (Dahlqvist and Wiklund, 2012). Therefore, opportunity discovering entrepreneurs are no market (co-) creators.

Regarding the relation of opportunity discovery and market development, in matured markets the number of product variants consolidates which actually "…define(s) the market" (Geroski, 2003; p. 102). Then a dominant design unifies different tastes of plenty of customers, which have a proper idea about the utility of the product, their expected performance and the value of the product (Geroski, 2003).

Thus, only when a market has a certain establishment, something like objective discovery opportunities may start to exist (Alvarez et al., 2012). Put differently, arbitrage, even in an intertemporal sense that resources are combined to a new product which can be sold at a higher price than its components (Buenstorf, 2007), requires that there exists knowledge about reservation prices or clearly defined preferences.

Accordingly, opportunity discovery implicitly assumes that choosing entrepreneurs face an environment in which distributions of future events are known or at least are assessable. Hence, opportunity discovery is rather a dominant strategy in established markets in which bounded rationality and imperfect information leads to arbitrage possibilities (Chandler et al., 2003; Alvarez and Barney, 2007).

2.3 Determinants of market novelty

2.3.1 Entrepreneurial characteristics as predictor of market novelty

The conceptual distinction between opportunity discovery and opportunity creation is important because both result from different entrepreneurial characteristics (Sarasvathy and Dew, 2005; Alvarez and Barney, 2007; Dew et al. 2011). The above introduced evolutionary framework considers this matter. For example, individual or organizational tacit knowledge and routines are generally hard to copy but constitute important factors shaping new opportunities (Buenstorf, 2007). Regarding organizational knowledge, we test the relationship between industry related experience and market novelty. Other research found social interrelations of entrepreneurs to predict the creation of entrepreneurial opportunities and new markets (Aldrich and Fiol, 1994). In the following, we test this prediction. Finally, differences in individual and organizational behavior are regarded as crucial drivers of new market creation (Aldrich and Kenworthy, 1999). Innovations represent a divergent organizational behavior and may predict market novelty (Dahlqvist and Wiklund, 2012). Thus, different innovation strategies (i.e., the introduction of product or process innovations) on the degree of market novelty are probed. Taken together, we expect that idiosyncrasies of the entrepreneurs and their organization may explain different propensities for entering into existing or (co-)creating novel markets.

2.3.2 Industry-related knowledge and expertise

In the framework of opportunity creation, novel markets are usually not developed out of prior existing markets, because the attributes of newly created opportunities are hardly ascertainable ex-ante (Dosi, 1982; Alvarez and Barney, 2007; O'Connor and Rice, 2012). An entrepreneur's industry-related knowledge and expertise allows dealing with the tasks and problems specific to the industry the new venture is operating in. Theoretical arguments also suggest that existing knowledge decreases the effort to change capabilities, while it also reduces the stimulus to create new opportunities (Cohen and Levinthal, 1994; Levinthal and March, 1993; Aldrich and Kenworthy, 1999; Danneels, 2007). The engagement of entrepreneurs in creating new opportunities nevertheless depends on the learning endeavors in direction to them (Cohen and Levinthal, 1994). For instance, expertise in related industries may lead to a strong reliance on experience knowledge about customer needs. In turn, this reliance narrows the view of decision-makers on the applicability of business solutions instead of novelty and innovativeness (Christensen and Bower, 1996; Im and Workman, 2004; Danneels, 2007). Consequently, entrepreneurs with existing customer relationships should have a lower tendency to create new markets (Dew et al., 2008).

Another argument for a strong link between lower levels of industry-related knowledge and new market creation is the lack of knowledge regarding existing routines and operational practices (Aldrich and Kenworthy, 1999). As a consequence, lower levels of industry experience should increase the likelihood of setting up a market creating firm instead of copying a business idea from an established market. Summing up, we propose that:

Hypothesis 1: Industry-related knowledge and expertise is negatively related to market novelty.

2.3.3 Entrepreneurial experience

According to the entrepreneurship literature, experience gained during earlier entrepreneurial episodes increases the likelihood of creating an entirely new market with the current entrepreneurial project (Sarasvathy and Dew; 2005; Alvarez et al., 2010; Dew et al., 2011). In particular, experiential knowledge about acting under

uncertainty may be helpful in shaping entirely new entrepreneurial opportunities (Alvarez et al., 2010). Such knowledge allows us to recognize meaningful patterns and problem solutions in a fuzzy setting (Baron and Ensley, 2006), which may be particularly prevalent when a newly created entrepreneurial opportunity is being exploited. Moreover, opportunity creation requires leadership as this enterprise is hardly fulfilled by a single actor. Consequently, because efficient leadership emerges from experience, experienced entrepreneurs are more likely to create ventures which establish in novel markets (Alvarez and Barney, 2007). Firm founders with previous start-up experience may also have developed networks of contacts to potential stakeholders (e.g., customers, suppliers, financiers). The involvement of these networks in developing the architecture of new markets entails establishing partnerships and commitments. These institutional settings are dependent on many parties beyond the individual entrepreneur. Thus, the variety of new knowledge which comes into the opportunity creation process through network ties of experienced entrepreneurs is comparably higher. Taken together, experienced entrepreneurs are more likely to attain a higher degree of market novelty when setting up new firms (Sarastvathy and Dew, 2005; Dew et al., 2011). Hence, the following hypothesis applies:

Hypothesis 2: Entrepreneurial experience is positively related to market novelty.

2.3.4 Entrepreneurial personality

To Schumpeter (2002, p. 417), the entrepreneur in his role as the creative destructor "…uses his personality and nothing but his personality". In fact, there is a well-established literature linking personality with entrepreneurial status (Zhao and Seibert, 2006; Rauch and Frese, 2007; Zhao et al., 2010), and hence may be associated with the nature of opportunities entrepreneurs pursue too (Short et al., 2010). Furthermore, in order to exploit created opportunities, oftentimes charismatic leadership is necessary to fill other stakeholders with enthusiasm and to acquire resources for highly uncertain endeavors (Alvarez and Barney, 2007). Charismatic leadership decreases the perceived costs of followers under uncertainty and thus encourages them to invest in opportunity creation, which is highly uncertain (Alvarez and Barney, 2005). In turn, the realization of projects with a high degree of market

novelty becomes more likely. However, charismatic leadership not only hinges on experience or expertise (Alvarez and Barney, 2007). Leadership is in fact related to an entrepreneurial personality profile[7] (Schmitt-Rodermund, 2004). We therefore expect the lead founders' charismatic leadership to be more pronounced if he possesses an entrepreneurial personality. On this ground, we propose:

Hypothesis 3a: An entrepreneurial personality profile of the lead-founder is positively related to market novelty.

Looking at the nature of opportunities, Shane (2003) argues that personality is not related to opportunity discovery. As we suggested that matured markets are predestined for opportunity discovery rather than creation, we expect an entrepreneurial personality profile not to be influential at the lower tail of the market novelty distribution. In contrast, at higher degrees of market novelty, personality is a crucial ingredient which is beneficial for creative destruction (Schumpeter, 2002; Alvarez and Barney, 2007). We therefore expect that:

Hypothesis 3b: An entrepreneurial personality profile has an effect at the upper but not at the lower quantiles of market novelty.

2.3.5 New ventures' innovation strategy: product and process innovation

The evolutionary perspective on market development allows us to link the degree of market novelty of an entrepreneurial venture with its innovation strategy. An illustration of this relationship can be drawn from Figure 2.1.

[7] Schmitt-Rodermund (2004) suggests that an entrepreneurial personality is characterized by low agreeableness, high conscientiousness, high extraversion, low neuroticism, and high openness.

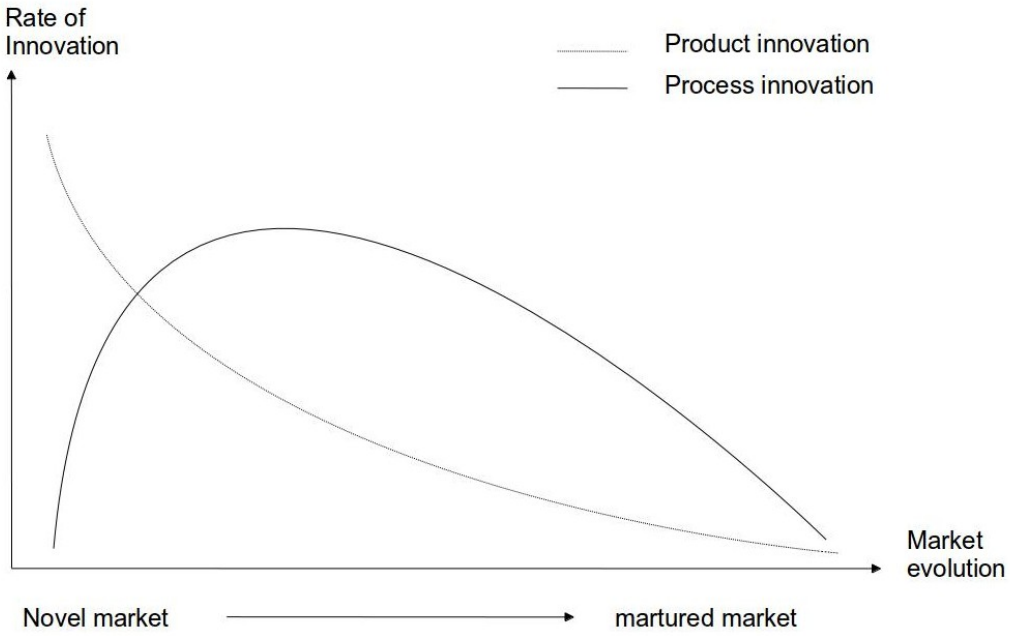

Figure 2.1: Relationship between the rate of innovation and market novelty (adapted from Utterback & Abernathy, 1975)

At the starting point of market evolution, the development of underlying technologies is usually indeterminable. Uncertainty and multiple possible technological directions encourage and enable the entry of new businesses introducing competing product solutions (Dosi, 1982). At this stage, newly created markets are best circumscribed as being "fluid" with product designs and production processes being far from stable and well founded. Within these markets even the demand side is characterized by uncertainty. Competitive advantages are derived from product performance and differentiation (instead of a superior cost structure). Therefore, the dominant strategy for market entry is exploiting product innovations rather than process innovations (Utterback and Abernathy, 1975; Clark, 1985; Klepper, 1997).

Over the course of market evolution, however, markets act as selection mechanisms and narrow down the scope of design alternatives as well as the possibilities and incentives for entrepreneurs to realize product innovations (Dosi, 1982, 1988; Klepper, 1997). Market selection becomes possible after the initial stage, because producers and users accumulate knowledge in the production process and consumption within a market, which defines a certain range of competing products. Even though competition in this stage of market evolution still takes place through

different product attributes and minor product innovations, several stable product designs emerge. Accordingly, customers gain familiarity with products as well as narrowly defined preferences. In turn, this leads to more customized marketing and production. Consequently, product innovation opportunities decrease whereas process innovations become increasingly important. At this stage of market evolution, the rate of product and process innovation within the market is similarly high (Abernathy and Utterback, 1975; Clark, 1985; Klepper, 1997). Hence, entering entrepreneurs are most likely to perform product as well as process innovations.

As customers and producers are increasingly familiar with the emerging dominant product design through the evolution of markets, market uncertainty diminishes. Unit output increases and process innovations outperform product innovations with respect to competitive advantages for entering entrepreneurial firms (Abernathy and Utterback, 1975; Clark, 1985, Klepper, 1997). A driving force in this respect is the technological lock-in effects. In more detail, knowledge accumulation increases the efficiency of exploiting one technological solution over the other through economies of learning. As a result, market forces ruled out most of the competing product innovations. Moreover, the introduction of new product innovations through entering entrepreneurs becomes inefficient and thus hardly occurs (Dosi, 1988; Arthur, 1989).

In the last stage of market evolution, the product has a dominant design. Thus, production on a large scale in a systemic production process takes place. Competition among firms is conducted by costs and product prices. Under these conditions, production is highly capital intensive and major changes in product features or production processes are highly expensive and neither efficient nor effective. Innovative activities are now rather observable outside of the market by suppliers of production technologies (Abernathy and Utterback, 1975). Hence, the rate of innovation within the market is rather low and entering entrepreneurs are neither expected to introduce product nor process innovations.

Correspondingly, we expect that a new venture pursuing a product innovation strategy is more likely to create a novel market than a new venture pursuing another innovation strategy (i.e., process innovation strategy, product *and* process innovation strategy, non-innovation strategy). Accordingly, we formulate the following hypotheses:

Hypothesis 4: Compared to a start-up based on a product *and* process innovation, a pure product innovation strategy is positively related to market novelty.

Hypothesis 5: Compared to a start-up based on a product *and* process innovation, a pure process innovation strategy is negatively related to market novelty.

Hypothesis 6: Compared to a start-up based on a product *and* process innovation, a non- innovation strategy is negatively related to market novelty.

2.4 Data and Methods

2.4.1 Data

The data for our analysis stems from the Thuringian Founder Study (TFS), an interdisciplinary research project on determinants of successful entrepreneurship in Germany. The dataset drew from the German trade register (Handelsregister) for commercial and private companies, recording 2971 technology-oriented or knowledge-based start-ups (according to ZEW classification; Grupp et al., 2000) founded between 1994 and 2006 in Thuringia, Germany. From this list of firms, the research team of the TFS selected a random sample of 2604 start-ups. Founders of these firms were contacted by mail and telephone in order to recruit one founder per start-up, resulting in a response rate of 24.5% (based on the number of start-ups). Note that an important advantage of this recruitment procedure is the possibility to interview founders whose companies were already closed down. Hence, there is no bias toward surviving or particularly successful firms. Finally, 639 structured face-to-face interviews were carried out by the research team of the TFS in 2008. On average, an interview took one and a half hours. A key-informant approach was employed to collect the data. In case of a team start-up, the lead-entrepreneur provided information on skills and prior experiences of each team member as well as the characteristics of the business start-up.

Some of the collected data refers to retrospective information (e.g., earlier events in the entrepreneur's life and business history) which can be subject to memory decay (Davidsson. 2008). To ensure data validity, the research team of the TFS employed the Life History Calendar (LHC) method (see Caspi et al., 1996 for a detailed description of the LHC method). Broadly speaking, the LHC employs

mnemonic techniques using cognitive and visual memory anchors and retrieval cues. This method has been shown to collect more valid and reliable retrospective data than traditional questionnaires (Belli et al., 2004).

Overall, 133 cases had to be excluded either due to missing data or because they turned out not to be genuine new start-ups but subsidiaries of existing companies. This leaves us with a final sample of 455 valid cases.

2.4.2 Dependent variable: Market novelty

The few existing measures of the novelty of entrepreneurial markets (Dahlqvist and Wiklund, 2012) strongly rely on the work of Kirzner (1997), which posits that opportunities for entrepreneurial action are exogenously given (rather than endogenously created). Since we assume a continuum between creating new markets and entering into existing ones, such an operationalization of market novelty would be prone to measurement error.

In the present paper, we extend previous work and measure the novelty of entrepreneurial markets from an *evolutionary perspective* of market development. Start-ups' market novelty is captured with four five-point bipolar scales (Item 1: 1 = "The target market was an established market" vs. 5 = "The target market was a young and strongly growing market"; Item 2: 1 = "The founding product targeted an established demand" vs. 5 = "The founding product created an entirely new market"; Item 3: 1 = "On the target market, there existed many competitors" vs. 5 = "On the target market, there existed no or just a few competitors"; Item 4: 1 = "The business model is not new" vs. 5 = "The business model is entirely new to the world"). Items 1-3 are motivated by theoretical arguments put forward in the previous parts of the paper. Item 4 is derived from the literature which emphasizes business models as the architecture in which a new venture exploits its underlying business opportunity (George and Bock, 2011). On the one hand, established business models can hinder the creation of breakthrough opportunities and new markets. On the other hand, innovative business models are established simultaneously to the creation of new markets (O'Connor and Rice, 2012) or new markets are created by innovative business models (Holloway and Sebastiao, 2010). Thus, the novelty of a business model can be an important indicator of market novelty of the respective company.

A confirmatory factor analysis indicates significant factor loadings ($p < .001$)

of the four market novelty items, ranging from .48 to .61 (χ^2 (2) = 10.306, p = .006, CFI = .948, RMSEA = .095). We z-standardized and averaged the four market novelty items, resulting in the final variable *market novelty* (α = .63).

2.4.3 Independent variables

We measured *industry experience* with a dummy variable indicating whether at least one founder of the start-up had acquired experience in the new venture's industry within the three years prior to the first steps in the venture creation process (0 = no, 1 = yes).

Entrepreneurial experience was measured with a dummy variable indicating whether at least one founder of the start-up had launched another start-up prior to the first steps in the venture creation process (0 = no, 1 = yes).

The measure of an *entrepreneurial personality* is based on the Big Five model of personality which was assessed using a well-validated German 45-item questionnaire (Ostendorf, 1990). Agreeableness (e.g., "good-natured vs. cranky"), conscientiousness (e.g., "lazy vs. diligent"), extraversion (e.g., "uncommunicative vs. talkative"), neuroticism (e.g., "vulnerable vs. robust"), and openness (e.g., "conventional vs. inventive") were measured by nine bipolar items each with answers ranging from (0) to (5). Cronbach's α coefficients exceeding 0.6 for all five traits indicating the internal consistency of the scales. Following previous research (Schmitt-Rodermund, 2004, 2007), we defined an entrepreneurial reference type with the highest possible score (5) in extraversion, conscientiousness, and openness, and the lowest possible score (0) in agreeableness and neuroticism. We then calculated an index for an individual's fit with this reference type. First, we estimated each interviewee's squared differences between the reference values and the personal values on each of the five scales. For example, if a person scored a 3 in neuroticism, the squared difference is 9 (because the reference value is 0). Second, the five squared differences were summed up for each person and, third, the algebraic sign of this sum was reversed (e.g., a value of 5 became -5). The resulting value served as the final variable entrepreneurial personality. The closer to 0 the values in this variable, the better the fit between an individual's Big Five personality profile and the defined entrepreneurial reference type.

With respect to venture type in terms of innovativeness, we differentiated whether the start-up's business idea was based on a *product innovation* ("Compared to your competitors, is your business idea based on a product or service that is new or qualitatively better?"; 0 = no, 1 = yes), a *process innovation* ("Compared to your competitors, is your business idea based on a product or service that has a higher value or could be faster or cheaper produced?"; 0 = no, 1 = yes), *product and process innovation* (0 = no, 1 = yes, control group) or *no innovation* (0 = no, 1 = yes).

2.4.4 Controls

The empirical analysis is controlled for a number of factors which fall outside the purview of this study's theoretical focus, yet might potentially affect market novelty when setting up an entrepreneurial firm.

With respect to founder-specific control variables, we controlled for the *number of founding partners* at the time of new venture creation. We also took account of founders' *formal education* (highest educational attainment of the founders: 0 = none, 1 = university degree, 2 = doctorate).

Referring to firm-specific control variables, we capture a start-up's technological endowment using two variables, *patent stock* (number of patents which the founder(s) applied either as inventor or applicant within the last two years prior to venture set-up) and *prototype* (indicating whether the start-up possessed a prototype of their core product at the time of new venture creation). The variable *start-up capital* indicates the total amount of financial resources available at the time of venture set-up. We also controlled for whether the entrepreneurial firm is an *academic spin-off* (0 = no, 1 = yes).

Finally, we capture industry-specific and year-specific effects on market novelty of entrepreneurial firms. Industry peculiarities are accounted for with five *sector-dummies* (industry sector of the start-up following NACE classification, recoded into dummy variables: (1) chemical industry, metalworking industry and engineering, (2) electrical engineering, fine mechanics and optics, (3) wholesale and retail, (4) ICT, research & development and services, (5) other sectors). In order to control for possible temporal influences in the analyses, three *year-dummies* are included (start of the first business year, recoded into dummy variables: (1, control group) 1994-1998, (2) 1999-2001, (3) 2002-2008).

2.4.5 Estimation strategy

The evolutionary market process framework suggests that at earlier developmental market stages only a few firms create opportunities, while at later market stages many more entrepreneurial firms strive to discover opportunities. Therefore, an OLS regression might be inappropriate to grasp predictors of market novelty, because the distribution of market novelty is skewed. This supposition is supported by the Lorenz curve in Figure 2 and the histogram (with kernel density estimation) in Figure 3. The appropriate alternative to account for a skewed distribution in regression analysis is a quantile regression (Coad and Rao, 2008). The semi-parametric quantile regression approach remedies the problem of outliers and skewed distributions. Furthermore, a quantile regression allows for the acknowledgement of varying effects of predictors at different points of the distribution of the dependent variable (Buchinsky, 1994; see Buchinsky, 1998 for an overview).

According to Koenker and Basset (1978), market novelty y_i of firm *i* relates to vector x_i of $K \times 1$ explanatory variables at the sample quantile θ in the following way:

$$y_i = x_i^{'}\beta_\theta + u_{\theta i}, \quad Quant_\theta(y_i|x_i) = x_i^{'}\beta_\theta. \tag{1}$$

In (1) $Quant_\theta(y_i|x_i)$ represents the conditional quantile of y_i conditional on x_i. In order to derive the estimator β_θ, the error term $u_{\theta i}$ may be minimized with the help of linear programming. The linear estimator of β_θ is then a result of all observations, which are weighted by the ratio θ for those observations below the quantile θ and (1- θ) for those observations above it (Koenker and Hallock, 2001).

2.5 Results

Correlation coefficients presented in Tables 2.1 and 2.2 depict summary statistics of our final dataset. Table 2.3 shows the results of our regression analysis. The dependent variable is market novelty. Figure 4 depicts the coefficients of the quantile regression over the distribution of market novelty. Hypothesis 1 predicts that a founder teams experience in related industries decreases the degree of a start-up

respective market novelty. Our results corroborate this hypothesis, i.e. in case one founder team member possesses experience in related industries, the degree of market novelty is decreased by 0.32 ($p<0.01$), in comparison to a totally non-experienced founder team. This result holds true for the upper quantiles when a quantile regression is employed, as for the .25, .5, .75 and .9 quantile we estimate a significantly negative effect. Entrepreneurial experience of the founder (team) was suggested to be positively related with market novelty (Hypothesis 2). The coefficients of both, of the OLS and of the respective quantile regressions, are non-significant. Thus, Hypothesis 2 has to be rejected. Hypothesis 3a presupposes a relationship between an entrepreneurial personality profile and market novelty, while Hypothesis 3b claims that this result holds true only for the upper tails of the market novelty distribution. The result of the OLS regression supports Hypothesis 3a. Moreover, considering the results from the quantile regression, excepting the .9 quantile, the effect of the lead founder's entrepreneurial personality fit on market novelty is insignificant. Correspondingly, Hypothesis 3b is supported as well. Regarding firm innovativeness, we test whether certain innovation strategies are linked with market novelty. The comparison group is a product as well as a process innovation strategy for business start-up. Our results corroborate hypotheses 4-6. Particularly, in contrast with both a product and process innovation strategy, entrepreneurs who rely on a sole product innovation strategy reveal on average a 0.289 higher degree of market novelty ($p<0.01$). In line with our argumentation above, entrepreneurs who either decide to start-up without innovation ($p<0.01$) or solely process innovation ($p<0.01$) enter on average into markets that have a lower degree of novelty, 0.465 and 0.468, respectively. Excepting in cases of a sole product innovation strategy for the .1 and .25 quantile, those effects are significant over different quantiles of the market novelty distribution.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.
1. market novelty	1																		
2. product innovation	0.28*	1																	
3. process innovation	-0.28*	-0.22*	1																
4. no innovation	-0.28*	-0.18*	-0.28*	1															
5. entrepexp	0.04	-0.03	-0.01	-0.05	1														
6. industrexp	-0.18*	-0.03	0.05	0.07	0.02	1													
7. epersonality	0.10	0.06	-0.06	-0.06	-0.04	0.04	1												
8. number of founding partners	0.18*	0.08	-0.13*	-0.03	0.25*	0.07	-0.02	1											
9. formal education	0.20*	0.09	-0.03	-0.08	0.14*	0.11	-0.11	0.33*	1										
10. academic spin-off	0.28*	0.06	-0.07	-0.17*	0.02	-0.06	-0.13*	0.38*	0.39*	1									
11. start-up capital	0.07	-0.02	-0.05	-0.06	0.12*	0.03	0.01	0.09	0.14*	0.02	1								
12. patent stock	0.32*	0.17*	-0.13*	-0.20*	0.06	-0.06	0.05	0.09	0.23*	0.23*	0.18*	1							
13. prototype	0.17*	0.06	-0.04	-0.19*	-0.05	0.06	0.04	0.04	0.14*	0.14*	0.02	0.21*	1						
14. nace2	0.05	-0.02	0.03	-0.14*	0.04	0	-0.02	-0.04	-0.06	-0.07	0.19*	0.05	0	1					
15. nace3	0.14*	0.07	-0.04	-0.07	0.01	-0.09	0.04	0.11	0.07	0.06	0.11	0.24*	0.08	-0.30*	1				
16. nace5	-0.07	-0.03	-0.05	0.16*	-0.03	0.05	0.08	-0.03	-0.13*	-0.10	-0.04	-0.12	-0.08	-0.13*	-0.13*	1			
17. nace7	0.01	0.06	0.03	-0.01	0	0.04	-0.04	-0.01	0.09	0.14*	-0.18*	-0.09	0.03	-0.42*	-0.41*	-0.18*	1		
18. 1999-2001	-0.04	0	-0.01	0.03	0.03	0.09	-0.05	-0.02	0.01	-0.01	-0.01	0.04	0.05	-0.04	-0.03	-0.06	0.08	1	
19. 2002-2008	0.09	0	-0.01	-0.16*	-0.01	0.01	0.03	0.07	0	0.20*	0.03	0.01	0.08	-0.03	-0.07	0.01	0.11	-0.37*	1

*p<.01

Table 2.1: Correlation coefficients

	Mean	SD	Min	Max
market novelty	0.00	0.70	-1.14	1.70
product innovation	0.13	0.33	0	1
process innovation	0.25	0.43	0	1
no innovation	0.19	0.39	0	1
entrepexp	0.42	0.49	0	1
industrexp	0.89	0.32	0	1
epersonality	-21.53	5.71	-57.81	-6.49
number of founding partners	2.29	1.16	1	5
formal education	1.06	0.63	0	2
academic spin-off	0.16	0.37	0	1
start-up capital	3.35	1.33	1	7
patent stock	0	1	-0.15	18.92
prototype	0.18	0.38	0	1
nace2	0.24	0.43	0	1
nace3	0.23	0.42	0	1
nace5	0.05	0.23	0	1
nace7	0.37	0.48	0	1
1999-2001	0.26	0.44	0	1
2002-2008	0.28	0.45	0	1

Table 2.2: Summary statistics

Dep. Var: market novelty	OLS	q10	q25	q50	q75	q90
product innovation	0.289***	0.192	0.210	0.395**	0.318***	0.220*
	(0.0926)	(0.166)	(0.160)	(0.158)	(0.119)	(0.130)
process innovation	-0.468***	-0.372***	-0.416***	-0.478***	-0.472***	-0.469***
	(0.0701)	(0.0938)	(0.0934)	(0.0973)	(0.121)	(0.149)
no innovation	-0.465***	-0.338***	-0.448***	-0.496***	-0.583***	-0.313*
	(0.0758)	(0.110)	(0.108)	(0.103)	(0.140)	(0.176)
entrepexp	-0.00858	0.0495	0.0516	-0.0490	0.00136	0.0865
	(0.0571)	(0.0794)	(0.0769)	(0.0850)	(0.0852)	(0.120)
industrexp	-0.320***	-0.0819	-0.398**	-0.447***	-0.384***	-0.399**
	(0.0932)	(0.205)	(0.159)	(0.129)	(0.146)	(0.155)
epersonality	0.0118**	0.00478	0.00956	0.00944	0.0145	0.0200**
	(0.00463)	(0.00575)	(0.00632)	(0.00744)	(0.00891)	(0.00988)
number of founding partners	0.0226	0.0232	-0.00324	0.0372	0.0287	0.0155
	(0.0260)	(0.0381)	(0.0373)	(0.0413)	(0.0396)	(0.0479)
formal education	0.119**	0.0574	0.148**	0.156**	0.179*	0.105
	(0.0516)	(0.0610)	(0.0723)	(0.0733)	(0.0962)	(0.0925)
academic spin-off	0.287***	0.196	0.346**	0.307**	0.163	0.232*
	(0.0950)	(0.155)	(0.171)	(0.144)	(0.141)	(0.137)
start-up capital	0.00148	-0.00697	0.00531	0.00160	-0.000756	0.0530
	(0.0224)	(0.0299)	(0.0323)	(0.0315)	(0.0364)	(0.0441)
patent stock	0.00268	0.0216	-0.00399	-0.0170	0.0924	0.0389
	(0.0259)	(0.0965)	(0.0924)	(0.104)	(0.0839)	(0.0688)
prototype	0.0988	0.215*	0.146	0.113	0.00335	-0.0407
	(0.0708)	(0.114)	(0.112)	(0.106)	(0.114)	(0.134)
nace2	0.281***	0.198	0.225*	0.238	0.304**	0.381**
	(0.0938)	(0.127)	(0.122)	(0.146)	(0.154)	(0.180)
nace3	0.286***	0.170	0.180	0.246	0.319*	0.327
	(0.0990)	(0.122)	(0.128)	(0.157)	(0.163)	(0.200)
nace5	0.202	0.128	0.216	0.179	0.160	0.0557
	(0.124)	(0.153)	(0.151)	(0.193)	(0.213)	(0.244)
nace7	0.218**	0.0871	0.195*	0.0979	0.270**	0.288*
	(0.0883)	(0.123)	(0.116)	(0.143)	(0.137)	(0.158)
1999-2001	-0.0262	0.0299	-0.0376	-0.0228	-0.0460	-0.0789
	(0.0645)	(0.0871)	(0.0939)	(0.107)	(0.108)	(0.116)
2002-2008	0.0126	0.00311	-0.00700	-0.0267	0.0434	0.130
	(0.0688)	(0.0902)	(0.109)	(0.0954)	(0.111)	(0.139)
_cons	0.252	-0.715**	-0.119	0.265	0.734**	1.043***
	(0.178)	(0.306)	(0.252)	(0.243)	(0.301)	(0.329)
N	455	455	455	455	455	455
R2	0.3451	0.1723	0.1871	0.2235	0.2234	0.2213

Standard errors in parentheses
* p<.1, ** p<.05, *** p<.01

Table 2.3: Regression analysis

2.6 Discussion and Conclusion

This study probes entrepreneurial determinants of market novelty of entrepreneurial firms. We find that industry related founder team experience is negatively linked with market novelty (Hypothesis 1). However, a founder teams' entrepreneurial experience is not related with market novelty and hence Hypothesis 2 was not supported by our results. The above estimations also suggest a positive

relationship between an entrepreneurial personality profile and market novelty (Hypothesis 3a). The quantile regression shows only a significant effect in the upper tail of the market novelty distribution, which corroborates Hypothesis 3b. With respect to the innovative activities, our results show that a sole product innovation strategy is linked with a higher degree of market novelty (Hypothesis 4). In contrast, starting-up in established markets accompanies with a non-innovation strategy (Hypothesis 5) or a sole process innovation strategy (Hypothesis 6).

The result that founder team experience in related industries negatively corresponds to market novelty and provides some evidence that building up new organizational forms or capabilities is contradicted by existing cognitive frameworks (Alvarez and Barney, 2007). At present, relatively little evidence exists for this relationship. So far, only case study evidence by O'Connor and Rice (2012) provides some insights in this regard. They show that relying on existing customer relationships, markets or alliances decreases the market novelty of innovations. The answer to the question why some entrepreneurs perhaps rely more on their existing capabilities when it comes to business start-up might be given by past success in related markets (see Audia et al., 2000; Gupta et al., 2006). An interesting finding concerns the insignificant effect of industry related experience at the .1 quantile. This finding might be explained by the fact that very low degrees of market novelty represent start-ups like franchise firms.

Entrepreneurial expertise was not related with market novelty. This contradicts existing evidence (Dew et al., 2011). However, experienced entrepreneurs may have a better understanding how prospective a novel market is (Baron and Ensley, 2006). For instance, Ucbasaran et al., (2009) find that experienced entrepreneurs generally identify opportunities with higher wealth creation potential. Further research may examine whether expertise with innovative entrepreneurship leads to higher degrees of market novelty. In addition, the interaction effect of market novelty and entrepreneurial expertise on venture performance is a fruitful future research avenue.

We find that an entrepreneurial personality profile, on average, increases the inclination to start up in rather novel markets. Looking at different points in the distribution, this effect vanishes at very low degrees of market novelty. This finding corresponds with the nature of opportunities at different developmental market stages. At low degrees of market novelty, rather opportunity discovery is prevailing

and thus cognition rather than personality traits may become important when opportunities are exploited (see Shane, 2003). In contrast, the creation of new markets requires entrepreneurial creativity (Amabile, 1996). And creativity is associated with personality (Feist, 1998; Zhao and Seibert, 2006). Future studies may focus on more narrow personality traits which can explain the creation of new markets, as narrow traits are suggested to be better predictors of entrepreneurial outcomes (Rauch and Frese, 2007a, 2007b). In a similar vein, personality might moderate the effect of market novelty on entrepreneurial performance. With respect to the creation of markets, entrepreneurial idiosyncrasies beyond the personality traits of entrepreneurs may be important. For example, Amabile (1996) proposed that intrinsic motivation promotes entrepreneurial creativity and the creation of novel markets, whereas extrinsic motivation is inimical. Therefore, these constructs ought to be taken into consideration in future studies on market novelty.

As expected by our hypotheses, innovation strategies pursued by entrepreneurial start-ups explain whether new markets are created or entry into established markets takes place. This finding underlines the important interplay between market development, technology and innovative entrepreneurship (Utterback and Abernathy, 1975; Dosi, 1988; Klepper, 1997). However, at present, evidence on innovative entrepreneurship and market evolution is scarce and the present study provides some insights in this regard. Thus, we follow the call of Dahlqvist and Wiklund (2012), who stressed the importance of acknowledging different kinds of innovations for market novelty. Accordingly we distinguish between a product and process innovation strategy.

Interestingly, at the .1 and .25 quantile the effect of product innovation on market novelty is not significant. However, our innovation measure does not grasp the radicalness of innovations. In this regard, breakthrough product or process innovations might be crucial for a high degree of market novelty (Tushman and Anderson; 1986; Olleros, 1986; Anderson and Tushman, 1990; O'Connor and Rice, 2012). Minor innovations maybe not have this effect. Hence, future research may also concentrate on the relationship between the radicalness of innovations and market novelty.

Our study provides several contributions. In general, the relationship between the nature of opportunities and entrepreneurial characteristics is a widely understudied field, and the present paper offers some additional insights. First of all,

we show that the degree of market novelty when entrepreneurial firms start up is negatively related with market related knowledge. Secondly, our results show that the personality of the lead founder of entrepreneurial firms affects entry into highly novel markets. Third, we find that the innovation strategy corresponds to the degree of entrepreneurial firms. Moreover, we draw on a model that integrates the evolutionary market theory with the nature of opportunities. This framework handles markets not only from a coordinating point of view, but rather from a process perspective. The advantage of this approach, in comparison to Dahlqvist and Wiklund (2012), is that the relationship between innovation strategies and market novelty can be explained.

Despite these contributions, our study has several limitations. One limitation refers to our data, which is restricted to entrepreneurs starting-up in highly innovative industries, while most of them are innovative. Nevertheless, the majority of business founders in Germany are non-innovative (Hagen et al., 2011). Therefore, generalizing our results to all kinds of business founders might be misleading. Future research might investigate a representative subsample of the whole population of business founders in order to achieve more generalizable results. Another limitation concerns our measure for product and process innovation. A measure acknowledging the radicalness of innovations may lead to further insights. Additionally, we only consider start-ups in investigating the determinants of entrepreneurial market novelty. Market entry and the pursuit of opportunities, however, may to a much larger extent take place from already existing firms through diversification (Buenstorf, 2007). A promising future research gap is the examination of market novelty determinants of both diversifier entrants and business start-ups. Finally, the creation of novelty markets and their evolution is a sociological phenomenon, which is hardly fulfilled by a single entrepreneurial firm (see Fligstein, 2001). Therefore other studies may investigate the interplay between different actors when it comes to the emergence and evolution of markets.

In conclusion, Buenstorf (2007) proposes that evolutionary economics is a promising approach in entrepreneurship research in order to explain the nature of opportunities which entrepreneurs pursue. The evolutionary approach stresses the importance of entrepreneurial idiosyncrasies, like the knowledge constituting organizations or the experience of the individual lead founder. Moreover, from the evolutionary perspective, the rate of innovation is important in explaining the stage

of market development. These suppositions are mirrored by our results and therefore entrepreneurship research may be informed from insights of the evolutionary economics branch.

3 Chapter: Technological discontinuities, endogenous entry timing and firm performance[8]

3.1 Introduction

In the literature on industry evolution, scholars have established two major empirical findings that help explain the success of individual firms. First, in many industries differences in firm survival are systematically related to the time of entry into the industry. More specifically, early entry into an industry frequently leads to higher survival prospects than delayed entry (Suarez and Utterback, 1995; Agarwal, 1997; Klepper, 2002a; Peltoniemi, 2011 for a review), and though it may depend on the speed of market evolution as well as the development of technology, these first-mover advantages may be muted (Robinson et al, 1992; Suarez and Lanzolla, 2007; Peltoniemi, 2011 for a review). Second, pre-entry experience, especially from related industries, increases the survival chances of diverse entrants as compared to *de novo* entrants (Agarwal and Gort, 1996; Klepper, 2002a; Agarwal et al.; 2004; Buenstorf, 2007). It seems that diversifying firms can transfer at least part of their previously developed capabilities to a new industry setting (Chatterjee and Wernerfelt, 1991; Farjoun, 1994; Tanriverdi and Venkataraman, 2005).

The relationship between both these empirical regularities is much less well understood. However, particularly for diversifying entrants, the timing of entry into a new industry is a strategic decision-making variable. On the one hand, observing advantages of early entry may reflect that superior firms entered first. On the other hand, potential diversifiers may decide to delay entry until competence requirements in the new industry change to become a better match for their own resource and capability endowments. If these considerations are empirically relevant, entry timing cannot therefore be considered an exogenous variable. In turn, empirically observable cohort differences in firm survival (Klepper, 2002a) may not actually be caused by differences in entry timing, but may simply reflect the changing composition of the population of entrants in terms of capabilities and how well these match the competence requirements prevailing in the industry at any given time.

The present paper aims to help provide a better understanding of how entry

[8] A presentation of an earlier paper version of this chapter at the EARIE 2012 Conference in Rome, Italy, was granted with the Presentation Award of the Verein für Socialpolitik (sponsored by Schweizerische Nationalbank).

timing and different types of pre-entry experience are interrelated and thereby jointly influence post-entry performance in industry evolution. We build on the seminal theoretical work of Helfat and Liebermann (2002) and argue that, as an industry evolves, different types of firms are attracted respectively different capabilities are required to enter the market successfully. Consequently, the decision to enter an industry at a specific point in time relies on the *matching* of the entrant's set of capabilities and the prevailing market requirements, as does their subsequent performance. This becomes especially apparent in times of disruptive technological change (Tushman and Anderson, 1986; Sosa, 2013), or during the emergence of new submarkets, when we can observe new (types of) entrants joining the market while incumbents are leaving. However, present studies of industry evolution do not consider the issue of self selection into an industry and argue that it is not apparent (see Bayus and Agarwal, 2007; Franco et al., 2009), although the respective justifications are not satisfying.[9] Moreover, some scholars particularly emphasize the importance of endogenous market entry (Helfat and Lieberman, 2002; Boulding and Christen, 2003; Lee, 2008).

Using empirical methods, we analyze a unique dataset tracing the long-term evolution of the German farm tractor industry (1896-2006) to study the interrelation between entry timing, pre-entry experience and firm performance. Following the lead of Helfat and Liebermann (2002), the focus of the analysis is on the endogeneity of entry time. We first show that the emergence of a new tractor submarket after 1927 induced a new wave of entry, which was predominately composed of diversifying firms with suitable backgrounds to succeed in the newly emerging submarket. Using a propensity score matching approach in discrete-time hazard models, we then show

[9] Bayus and Agarwal (2007, p. 1898) find that in the US, personal computer industry entrants with technical or technical as well as marketing experience have survival advantages, although those advantages diminish for later entrants. They use a Cox regression in which the entry time represents the spell in order to test for endogenous entry. The authors then wrongly interpret a positive coefficient of the hazard rate for successful entrants with technical experience as an indication for late entry. As a consequence, they reject the problem of firm selection into the industry. However, a higher hazard rate of entry time indicates an earlier entry for successful firms with technical experience, which actually argues in favor of endogenous entry. This contradiction was confirmed by Agarwal (2013, personal communication).

Franco et al. (2009) investigate the relationship between technological capabilities, market pioneering and firm survival. They find that technological capabilities positively affect the survival of market pioneers. On the other hand, the authors argue that technological capabilities not affect pioneering market entry, but are thus also against endogeneity. This conclusion is drawn from t-tests and Granger causality tests. Although the tests are not significant, this evidence is not quite convincing, as the authors compare respectively 11 pioneering new industry entrants and 10 pioneering incumbents with the other entrants, which is a quite low number of observations.

that statistical associations for entry timing and firm performance are sensitive to (not) controlling for the endogeneity of entry timing. We moreover find that the competitive relevance of specific types of pre-entry experience changes over time. This allowed the post-1927 entrants to take over industry leadership from the early entrants.

The remainder of the chapter is organized as follows. Section 3.2 provides the theoretical background and develops testable hypotheses for the empirical analysis. In Section 3.3 we provide an overview of our empirical setting, the German farm tractor industry. Data and empirical methods are introduced in Section 3.4. Section 3.5 presents the results of the empirical analysis, and Section 3.6 concludes.

3.2 Theoretical considerations

3.2.1 First-mover advantage, product heterogeneity and industry evolution

Early entrants into an industry have frequently been said to benefit from having advantages over competitors who enter later (cf., e.g., Agarwal and Gort, 1996; Agarwal, 1997, for empirical evidence). In general terms, first-mover advantages of early entrants can be explained by their having a head start on the learning curve. More precisely, being able to start the accumulation of industry- and product-relevant knowledge early on helps entrants lower their costs, increase their higher market shares and thus attain higher performance and longevity (Liebermann and Montgomery, 1988, Jovanovic and MacDonald, 1994; Klepper, 1996). However, industry leadership is often evasive. Given a highly mobile workforce, research publications and reverse engineering, accumulated knowledge can often not be retained proprietary (Mansfield, 1985; Liebermann and Montgomery, 1988). Later entrants may then be able to free-ride on the initial investment by market pioneers (Mansfield et al., 1981). In line with these considerations, the managerial relevance of first-mover advantages has been challenged by studies investigating the conditions under which this allegedly universal pattern is not observed (Suarez and Lanzolla, 2007). Olleros (1986; see also Lambkin and Day 1989; Christensen, 1993) was among the first scholars to highlight the fact that latecomers outperformed early entrants in industries such as typewriters, transistors, semiconductors or disk drives.

According to Wernerfelt and Karnani (1987) as well as Min et al. (2006),

whether or not early entrants will end up dominating a market strongly depends on product characteristics and market uncertainty. Tushman and Anderson (1986) argue that technologies undergo phases of incremental change but may also experience technological discontinuities. Incremental change leads to efficiency gains and performance increases; e.g. around a dominant design. In contrast, technological discontinuities are non-cumulative in nature. They mark breakthrough advancements over the prevailing technology that cannot be realized by gradual step-by-step improvements.

Discontinuities, which may take the form of newly introduced alternatives to the existing product or consist of major process-related advancements, can either be *competence-destroying* or *competence-enhancing* for the existing producers. If the new product, submarket or process requires knowledge and capabilities which are different from those previously developed, then discontinuities are competence-destroying. In this case, former industry leaders with dedicated technology-specific expertise are likely to lose their market dominance to new innovative market entrants. As a minimum, industry experience does not provide competitive advantages to incumbents vis-à-vis new entrants, as knowledge accumulated before the competence-destroying discontinuity can no longer be leveraged. In contrast, competence-enhancing discontinuities build on incumbents' existing expertise. They are therefore not likely to result in a significant shift of power away from established firms, but will instead reinforce their advantages, as posited by the first-generation models of industry evolution (Jovanovic and MacDonald, 1994; Klepper, 1996).

3.2.2 Heterogeneous entrants, endogenous timing of entry and firm performance

The above discussion indicates that first mover advantages are not a universal phenomenon, as pioneering firms may be outperformed by later entering competitors in the case of competence-destroying discontinuities introducing new forms of heterogeneity into product designs. While changes in the degree of product heterogeneity were highlighted, we have so far abstracted these from the heterogeneity of entrants. However, a sizable amount of the prior literature suggests that entrants differ in terms of their pre-entry experience and thus their resources and capabilities. Having access to a larger or better resource and capability base allows

for the generation of competitive advantage and is thus related to higher performance (Barney, 1991), with substantial repercussions for industry evolution.

It has been suggested that pre-entry experience influences firms when they enter into a new industry (Helfat and Lieberman, 2002; Lee, 2008). Before entering a new industry, firms form expectations about the future development of the targeted market, and about how far their resources and capabilities are useful with respect to the predicted development path. Thus, the decision to enter an industry or a newly emerging submarket at a specific point in time relates both to individual capability constellations and market conditions and how well they match at that particular point in time. As a consequence, when new product segments change market conditions in an existing industry, this may trigger the entry of experienced firms that re-evaluate the match between their own resources and capabilities based on industry requirements.

In this view, entry decisions are not one-time decisions but rather represent a continuous evaluation process by the potential entrant. They are thus endogenous to the firm and its resources, as well as to the development of the respective market. At the same time, firms that once entered the market based on their capabilities given the original conditions may no longer be best equipped to meet the challenges of the changed competitive environment e.g. after a competence-destroying disruption. They may therefore be forced to exit despite their first-mover experience.

In this context, Helfat and Lieberman (2002) argue that success mainly depends on the type of pre-entry resources and capabilities the entrant possesses and whether or not these capabilities match the requirements of the industry at the time of entry. The crucial element in their reasoning is that markets undergo various evolutionary stages, attracting different types of firms, such as diversifiers or spin-offs, which enter the industry at different points in time. In particular the emergence of new customer segments or product niches gives rise to new waves of entry, which may be successful even vis-à-vis the competition of earlier entrants.

Diversifying entrants from related industries have often been found to be more successful and long-lived than start-up companies (e.g., Mitchell, 1991; Klepper and Simons, 2000). Helfat and Liebermann (2002) explain this pattern in terms of a larger resource and capability base possessed by diversifying entrants. This is not limited to financial resources, but particularly concerns technological knowledge and experience related to customer needs (Helfat and Raubitschek, 2000).

As Teece (1980, 1982) has pointed out, firms tend to acquire resources and capabilities that are context specific and which therefore can only be usefully deployed in a very limited set of environments, such as industry conditions or regional specificities (Helfat and Lieberman, 2002). However, a large amount of firms' capabilities are transferable to other markets. Some capabilities such as organizational resources and managerial knowledge are general in nature. Their usefulness is largely independent of the specific market the firm is active in. Others such as marketing, sales and distribution experience can often be leveraged when entering related markets.

In addition to diversifiers, *de novo* firms organized as spin-offs by employees leaving industry incumbents have also been identified as highly successful entrants in a variety of industry contexts. In the disk drive and other industries, spin-offs on average outperformed other de novo entrants, with spin-off performance directly related to parent firm performance (Agarwal et al., 2004, Franco and Filson, 2006, see also Klepper, 2009, for a survey). While diversifiers are often prominent among the early entrants into a new industry, in various industries successful late entry primarily reflects spin-off activities. This is not surprising since spin-off founders draw on their intimate industry-related knowledge, most importantly consisting of knowledge related to markets and customer needs (cf., e.g., Chatterji, 2009, for the medical devices industry). Accumulating this knowledge obviously requires that prospective spin-off founders have time to work in the respective industry.

Following Helfat and Liebermann (2002, see also Silverman, 1999; Miller, 2004), we expect firms' entry decisions to be endogenous, being driven by entrants' expectations at any given time of how well their resources and capabilities will match the requirements of the industry. In more detail, we refer to the concept of time-varying capability relevance developed by Lee (2008). In this approach, the classical resource-based view is refined. A firm's resource bundle hence reflects its ability to produce and sell a product successfully in a market at a certain point in time. As a consequence, firms which sense higher capability relevance are more likely to enter into a market.

Based on the above considerations, we expect that changes over time in the composition of entrants reflect changing prospects faced by individual types of entrants. Potential entrants will try to actually enter when conditions are best suited for them. In particular, strategic timing of entry will be a relevant issue for *de alio*

entrants pondering diversification from related industries. Newly emerging submarkets may then induce a new wave of entry by firms possessing the required capabilities to serve these submarkets. This leads us to predict that:

Hypothesis 1: Pre-existing (de alio) entrants into an industry (e.g., diversifiers from related industries) tend to enter when their resources and capabilities best match the requirements in the industry.

Endogeneity of enty timing as suggested by Hypothesis 1 can have profound implications for analyses of firm performance, which have received rather limited prior scholarly attention (Boulding and Christen, 2003; Peltoniemi, 2011). In general, performance differences between groups of firms that entered an industry at different points in time tend to be interpreted as being causally related to the timing of entry. As mentioned above, first-mover advantages have attracted the most interest in the prior literature. They have mainly been attributed to learning effects. However, if decisions about when to enter an industry are endogenous, then first-mover advantages, or more generally cohort effects on performance, need not be *caused* by the timing of entry. They may also reflect inherent differences in the resources / capabilities of the various cohorts of entrants (and how well they match the requirements of the industry at that time). Empirically controlling for the endogeneity of entry timing should then reduce the observable cohort effects on performance. These considerations inform our second hypothesis:

Hypothesis 2a: Observable performance differences between cohorts of entrants reflect the endogenous timing of entry.

Hypothesis 2b: Controlling for endogenous timing of entry reduces the statistical association between entry time and firm performance.

While Hypotheses 1 and 2 focus on the timing of entry and its association with a firm's performance, our final hypothesis addresses pre-entry experience as a foundation of entrants' resources and capabilities and therefore as a driver of firm performance. We generally expect that entrants' resources and capabilities predict

their performance in the industry. In industries faced with the emergence of new submarkets and competence-destroying discontinuities, the competitive relevance of individual resources and capabilities is likely to vary over time. Again following Helfat and Liebermann (2002), we moreover predict that more general capabilities such as organizational procedures, which develop as firms mature and whose usefulness is not limited to a specific industry, can have a systematic effect on a firm's performance. In addition, experience accumulated in related markets is expected to be important for entrants' ability to make correct inferences about the industry's future development and their own odds of survival. These conjectures are in line with Buenstorf's (2008) earlier findings for the U.S. farm tractor industry where diversifiers, especially those with a background in agricultural implements, outperformed de novo entrants. Based on this prior evidence, we expect technological expertise to be of lesser relevance as compared to organizational and market-related capabilities. We therefore hypothesize that:

Hypothesis 3a: Entrants whose resources and capabilities best match the requirements of the market at any given time tend to outperform other entrants.

Hypothesis 3b: Organizational and market-related capabilities are more relevant than technological capabilities as a determinant of firm performance.

3.3 Empirical context: technological discontinuities in the German farm tractor industry[10]

Farm tractors – defined here as agricultural traction machines powered by an internal combustion engine – were first invented in the U.S. (in 1889). They triggered an extraordinary growth in agricultural productivity in the 20th century (Olmstead and Rhode 2000). The German farm tractor industry was launched 1896 by Adolf Altman with his prototypic "Trakteur". In the first decades, the industry was dominated by single-purpose motor plows. [11] Their usefulness was limited to large croplands, which were concentrated in northern and eastern Germany. In contrast,

[10] This section heavily draws on the historical accounts by Bach (1999), Bauer (1987; 1995), Gebhard (1988; 2006) and Rödiger (1990).

[11] A motor plow is a plow carried by two or three wheels and powered by an internal combustion engine.

early farm tractors were not profitable for small scale farmers in southern Germany.

Demand for the German tractor industry noticeably increased after the end of World War I in 1918. Because of the war, there was a serious shortage of food, as well as a pronounced shortage of labor and draft horses, leading to an increased demand for mechanical power in agriculture. This promoted entry into the market, giving rise to the first peak in firm population size in 1920 with 48 active producers (Figure 3.1). Subsequently, firm numbers fell again to reach a low of 16 in 1932.

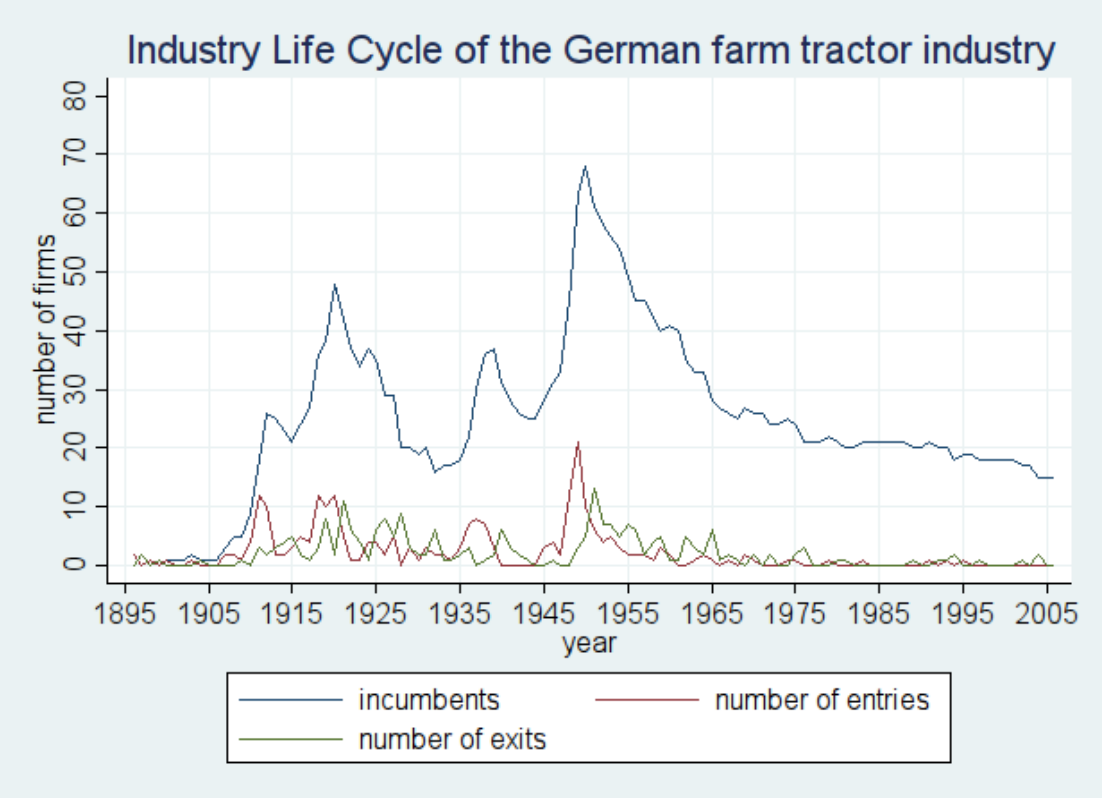

Figure 3.1: Lifecycle of the German farm tractor industry

The motor plow farm tractor design became extinct around 1928, when the multipurpose farm design had been established through a series of innovations. One of these was the use of Diesel engines for farm tractors pioneered by Benz-Sendling in 1922. In addition, several technological achievements from the U.S. were adopted by German producers at this time, such as block construction (in 1923) and assembly line production (in 1924). However, the decisive innovations contributing to the emergence of a new submarket through the multipurpose farm tractor design in the late 1920s were the standardized power takeoff and the balloon tire, both of which

were also taken over from U.S. producers, The standardized power takeoff was first used by German producers around 1927 and was well-established by the mid-1930s. It allowed tractors to be used as a versatile source of mechanical energy in a variety of farm applications, which was decisive in making farm tractors attractive to the small-scale farmers of Southern Germany. Balloon tires were introduced in the late 1920s in the U.S. farm tractor market. In Germany, the first serial production of farm tractor balloon tires was started in 1934 by Continental.

As the standardized power takeoff had been developed in the U.S., no particular technological expertise was required to introduce it in Germany. The other key components of the emerging multipurpose tractor design were borrowed from other industries (as the Diesel engine and/or from the U.S. market (assembly line production, block construction, balloon tire). The multipurpose tractor design can thus be interpreted as a competence-destroying discontinuity reducing the competitive relevance of technological competences as well as the market knowledge accumulated in the northern market. It was in-depth knowledge about agricultural procedures and customer needs in the South that was needed to perceive and exploit market opportunities there. This knowledge was mostly possessed by producers located in the South, in particular those with intimate experience of other agricultural markets.

Following this series of innovations, a boom in the German farm tractor market occurred around 1935, which was fueled by strongly increased demand from small farmers, especially in southern Germany. This new demand was primarily served by local producers designing and marketing small multipurpose farm tractors. Many of them were newly entering the industry at this time. Hence, a surge of entry into the industry took place from 1935 that strongly raised the number of producers in the market up to 37 in 1939.

The Nazi regime and the ensuing World War II brought drastic changes for German farm tractor producers. In 1939 the “Schell Plan” enacted by the Nazi government orchestrated a consolidation of the German farm tractor industry. To free resources for weapons production, the number of tractor types was cut by two thirds, forcing many producers to exit between 1939 and 1945 (Bauer, 1987; 1995). After the war, the large croplands of East Germany were no longer available to feed the Western population, and large areas of pasture land in South and West Germany were now transformed into cropland. At the same time, large parts of the German

infrastructure were destroyed and the allied forces imposed severe restrictions on manufacturing. In this market context of high demand for agricultural machinery and limitations in other product markets, many producers newly entered the (West) German farm tractor market. Another surge of entry from 1946 to 1950 ensued, leading to a third peak in firm numbers with a total of 67 active producers in 1951.

At the beginning of the 1960s, many German producers withdrew from the farm tractor market. This exit was triggered by various developments. First, markets were saturated, as even smaller German farms were usually equipped with farm tractors at this time. Second, foreign producers entered into the German market and increased the competition. Third, the farm tractor had become a highly homogeneous product and shakeout dynamics set in (Bhaskarabhatla and Klepper, 2009). In particular, the standardized three point suspension helped to establish a stable farm tractor design at this time. Overall, the number of registered farm tractors rose from 140.000 in 1949 to 1 million in 1963. From the beginning of the 1970s to the present, the number of active German producers has remained relatively stable at between 15 and 25.

3.4 Data and methods

3.4.1 Data

Our empirical analysis is based on a unique dataset encompassing the full population of German farm tractor producers, which was constructed from historical trade publications (Flücht and Blum 1942, Neubauer 1950, 1952, 1954, 1956, 1958, 1961, 1966) as well as more recent accounts of the industry's history (Herrmann 1987, Bauer 1987, 1995, Gebhardt 1988, 2006, Bach 1999). Altogether, we identified 293 entrants into the German farm tractor industry from 1896 to 2006. Out of this population, we were able to classify 246 firm or founder backgrounds. The majority of these entrants are experienced (226). In total, 187 entrants diversified out of other industries, 30 had re-entered[12] the German farm tractor market and 9 could be identified as spin-offs. We furthermore classified the pre-entry experience of the diversifying entrants, allowing for multiple experience backgrounds. A total of 88

[12] Re-entrants are firms that exit the German farm tractor market for more than five years and then re-enter. Correspondingly, firms that re-entered after less than six years are not treated as a new re-entrant. Rather we retain the original entrant type and deduct the period of market abstinence from the whole market spell.

diversifiers possessed experience in agricultural implements, 59 had produced non-agricultural vehicles such as trucks or automobiles, 26 were engine producers, and 117 had other types of pre-entry experience.

3.4.2 Dependent variables

We follow a two step empirical approach. We start with a simple logit regression to test whether, consistent with Hypothesis 1, the new submarket for small multi-purpose tractors emerging after 1927 indeed induced a specific type of entrants (diversifiers with market-related experience and from the South) to join the industry. We then adopt longevity as a general measure of firm performance and apply survival analysis to probe how the hazards of exit from the tractor industry was related to pre- and post-entry experience, as predicted by Hypotheses 3a and 3b. Since the underlying data on firm survival are based on annual observations, we employ discrete-time complementary log-log hazard rate regressions (Allison, 1982). Accordingly, the hazard rate is defined as

$$h_i(t) = 1 - \exp\left[-\exp\left(a_t + \beta_t x_i\right)\right], \qquad (1)$$

where $h_i(t)$ is the probability that firm i exits the German farm tractor industry in year t, given it survived up to t, a_t is a baseline hazard function that may be duration dependent, and β_t is a vector of coefficients estimating the relevance of firm characteristics x_i. (time-varying covariates should be allowed for in equation 1) for the hazard.

As we are interested in the hazards of exit due to poor firm performance, exits related to World War I or II are treated as censored observations. In line with earlier work on industry evolution (e.g., Klepper, 2002a), exits due to mergers or acquisitions are coded as follows. Firms that were acquired by foreign farm tractor producers that have not been active in the German market before are coded as continuing firms. If a German farm tractor producer acquired another one, the acquiring firm is coded as continuing, while the acquired firm is censored. We only have a single domestic acquisition in our sample, namely that of Daimler and Benz, which is handled intuitively. As Benz was the smaller firm, Daimler is the continuing

firm, while Benz is censored.

Hypothesis 1 posits that firms with regional and market-related knowledge are more likely to enter the German farm tractor market after 1927. If true, this gives rise to the empirical problem of sample selection bias or confounding when testing Hypotheses 3a and 3b (Deheija and Whaba, 2002; Imbens, 2004). In other words, if firms with promising local and market related experience were more likely to enter into the German farm tractor market after 1927, firms operating from 1928 onwards were generally more capable, and the hazard rate estimator for firms entering after 1927 will be downward biased. One way of overcoming this problem would be the inclusion of interactions of all relevant firm-background constellations with firm entry after 1927. However, for reasons of model parsimony and to economize on degrees of freedom, we prefer to use a propensity score weighting approach to handle the problem of market-entry selection bias.

Propensity score weighting is an efficient methodology to remove almost all sample selection bias (Lunceford and Davivian, 2004; Ukoumunne et al., 2010; Busso et al., 2011). It is based on first estimating the probability (propensity score) $\hat{e}_i(v)$ of a firm entering into the German farm tractor market after 1927, where v represents a vector of covariates. Second, a weighting estimator for the average causal effect of entering after 1927 $\Delta h(t)$, based on $h_i(t)$ and $\hat{e}_i(v)$, is generated. It is important not to employ the *true* entry probability $e_i(v)$ for the weights, which can be assured either by estimating it non-parametrically (Hirano et al., 2003; Imbens, 2004) or parametrically by using a logit estimation (Lunceford and Davidian, 2004). In the latter case, it is important that enough treated and untreated observations do not face too many covariates v so that perfect prediction is unlikely (Kline, 2011), which is valid in our case. $\Delta h(t)$ has the following shape (see Hirano et al., 2003; Lunceford and Davidian, 2004; Imbens 2004):

$$\Delta h(t) = \frac{\sum_{i=1}^{n} \frac{h_i(t) Z_i}{\hat{e}_i(v)}}{\sum_{i=1}^{n} \frac{Z_i}{\hat{e}_i(v)}} - \frac{\sum_{i=1}^{n} \frac{h_i(t)(1-Z_i)}{(1-\hat{e}_i(v))}}{\sum_{i=1}^{n} \frac{(1-Z_i)}{(1-\hat{e}_i(v))}} \qquad (2)$$

In (2) Z_i indicates whether entry into the German farm tractor market was after $(Z_i = 1)$ of before 1927 $(Z_i = 0)$. Thus, interpreting (2), every firm that entered until 1927 is assigned with a weight of $1/(1-\hat{e}_i(v))$, while firms that entered after 1927 are weighted by a factor of $1/\hat{e}_i(v)$. This procedure assures that observations with relatively a high $\hat{e}_i(v)$ are weighted more heavily in case they entered until 1927 and vice versa for firms that entered after 1927. Put differently, a pseudo population is generated which has the property of equally distributed pre-entry experiences across both examined entry cohorts, thus removing sample selection bias regarding local and market related knowledge (see Imbens, 2004; Hernan and Robins, 2006). The weights in (2) are normalized with the respective entry cohort sum of weights such that they always add up to 1, which helps ensure higher efficiency (Lunceford and Davidian, 2004; Imbens, 2004).

3.4.3 Independent variables

To test the hypotheses developed in Section 3.2, we focus on a set of explanatory variables accounting for entrants' pre-entry experience and regional background (location in or outside southern Germany). Experienced firms are divided into diversifiers, spin-offs, and firms re-entering the tractor industry after having exited before. For diversifiers, we can further distinguish between different types of backgrounds. We take prior experience in vehicle or engine production as an indication of technological capabilities, whereas experience in agricultural implements is interpreted as a source of market-related knowledge. Multiple backgrounds of individual firms are reflected by positive values for more than one of the respective indicator variables. Another indicator variable denotes the cohort of post-1927 entrants to allow the emergence of the multi-purpose farm tractor submarket to modify the influences on entry and performance.

The empirical analysis moreover controls for several other factors that may affect the hazard rates of German farm tractor producers. We control whether a firm was designated as a farm tractor producer in the Schell Plan (cf. above Section 3.3) and was thus authorized to make farm tractors between 1939 and 1945. We also control for market density, or, in other words, the number of competitors in the

market. Carroll and Hannan (1989) propose that the hazard rate has an inverted-U relationship with market density. We therefore control for the logarithm of market density as well as the squared logarithm of market density in *t*. To allow for agglomeration externalities to affect the hazard rate of industry exit, the share of all active producers in *t* that were located in the same region, or in an adjacent region, as the target firm is used as another control. As there might be regional spillover effects from related industries (Eriksson, 2011), we also control for the number of regional automobile firms. Data on the location and activity of German automobile firms was taken from Dressler (2006). Finally, several prior studies suggest that the hazard rate of market exit is duration dependent (Klepper, 2002; Cantner et al, 2006, Buenstorf and Guenther, 2011). Taking these findings into account, we allow for linear and squared effects of duration dependence.

All independent variables are listed and described in more detail in Table 3.1.

Experienced	Dummy that indicates whether the entrant is *experienced,* 1=YES, 0=NO.
Diversifier	Dummy that indicates whether the entrant is a *diversifier,* 1=YES, 0=NO.
Re-entrant	Dummy that shows whether the entrant is classified as a *re-entrant*, 1=YES, 0=NO.
Spin-Off	Dummy variable that shows whether the entrant is a *spin-off* or not, 1=YES, 0=NO.
Div Agr. Impl.	Dummy that indicates whether the diversifier has experience in the production of *agricultural implements*, 1=YES, 0=NO.
Div Vehicles	This variable shows whether the diversifier has pre-entry experience in the production of *vehicles*, 1=YES, 0=NO.
Div Engines	A Dummy that shows whether the diversifier has pre-entry experience in the production of *engines*, 1=YES, 0=NO.
Div Others	Dummy variable that indicates whether the diversifier possess *other* pre-entry experience than in agricultural implements, vehicles or engines*,* 1=YES, 0=NO.
ENTRY1927	*Entry-cohort from 1928-2007,* 1=YES, 0=NO.
South	Dummy variable that indicates whether the entering firm is located in South Germany (Southern German Federal States Bavaria or Baden-Wuerttemberg)*,* 1=YES, 0=NO.
2WW	Dummy that indicates whether the entrant was *active during the World War II, 1939-1945,* 1=YES, 0=NO.
LogMDEN	Time varying; renders the *logarithm of number of firms in the market.*
LogMDEN^2	Time varying; renders the *squared logarithm of number of firms in the market.*
RegDEN	Time varying; shows *the regional fraction of the whole number of firms in the market*. The region is mainly based on German counties, Raumordnungsregionen. In case the entrant was located in former German areas, we used Polish counties, Województwos, or French counties, Régions.
NRegDEN	Time varying; shows the *neighbour regional fraction of the whole number of firms in the market*. The region is mainly based on German counties, Raumordnungsregionen. In case the entrant was located in former German areas, we used Polish counties, Województwos, or French counties, Régions.
ARegN	Time varying; *shows the regional number of automobile firms in the market.* The region is mainly based on German counties, Raumordnungsregionen. In case the entrant was located in former German areas, we used Polish counties, Województwos, or French counties, Régions.
T	Time varying; indicates the *number of years of market experience from the time of entry.*
T^2	Time varying; indicates the *squared number of years of market experience from the time of entry.*

Table 3.1: Description of variables

3.5 Empirical results

Summary statistics of our data may be found in Table 3.2 and correlation coefficients may be taken from Table 3.3.[13]

The German farm tractor industry provides a highly suitable empirical context to assess the relevance of endogeneous entry timing and the performance

[13] The summary statistics and correlation table does not include the time-varying variables as those change every year in which the firms are operating. Thus, such one-dimensional measures as correlation coefficients have no explanatory power.

implications of differences in pre-entry experience. The decisive development in the industry's early decades was the emergence of the submarket for small multi-purpose tractors. Its timing can be pin-pointed to 1927 when the standardized power takeoff was introduced in Germany (cf. the above discussion in Section 3.3).

	Mean	SD	Max	Min
1. Experienced	0.924	0.265	1	0
2. Diversifiers	0.708	0.455	1	0
3. Reentrants	0.113	0.317	1	0
4. Spin-offs	0.215	0.412	1	0
5. Div Agr. Impl	0.488	0.5	1	0
6. Div Vehicles	0.325	0.469	1	0
7. Div Engines	0.162	0.369	1	0
8. Div Others	0.522	0.5	1	0
9. De Novo	0.075	0.265	1	0
10. ENTRY 1927	0.56	0.497	1	0
11. South	0.405	0.491	1	0
12. 2WW	0.162	0.369	1	0

Table 3.2: Summary statistics

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. Experienced	1.00											
2. Diversifiers	0.45***	1.00										
3. Reentrants	0.10*	-0.56***	1.00									
4. Spin-offs	0.15***	-0.82***	0.68***	1.00								
5. Div Agr. Impl	0.28***	-0.06	0.20***	0.24***	1.00							
6. Div Vehicles	0.20***	-0.03	0.01	0.17***	-0.10	1.00						
7. Div Engines	0.13**	-0.12**	0.10*	0.22***	-0.10*	0.15***	1.00					
8. Div Others	0.30***	0.32***	-0.16***	-0.16***	-0.07	-0.02	-0.05	1.00				
9. De Novo	-1.00***	-0.45***	-0.10*	-0.15***	-0.28***	-0.20***	-0.13**	-0.30***	1.00			
10. ENTRY 1927	0.21***	-0.05	0.20***	0.19***	0.27***	0.01	-0.15***	-0.08	-0.21***	1.00		
11. South	0.12**	-0.01	0.07	0.09	0.23***	0.07	0.05	-0.14**	-0.12**	0.33***	1.00	
12. 2WW	0.09	0.08	-0.03	-0.03	0.16***	0.11*	-0.00	-0.01	-0.09	0.23***	0.07	1.00

Table 3.3: Correlation coefficients

Hypothesis 1 predicted that *de alio* entrants enter when their resources and capabilities best match industry requirements. In the empirical context of the German tractor industry, this endogeneity of entry timing should lead to a higher likelihood of companies with a location in southern Germany and/or diversifying from an agricultural background to enter after 1927, when their market-based knowledge was of strategic value to exploit the opportunities opening up in the new submarket for multi-purpose tractors. The results of the logit regressions to test Hypothesis 1 are presented in Table 3.4. Model 1 confirms our conjecture with respect to the regional dimension. Model 2 further corroborates our prediction that both a location in southern Germany as well as pre-entry experience in agricultural implements are

directly related to entering the industry after 1927. We also observe that a background in engine production, which represented technological rather than market related experience, significantly lowered the likelihood of entering after 1927. In addition, standardized mean differences (cf. Austin, 2009) of the backgrounds of firms entering until and after 1927, respectively, are reported in Table 3.5. All values exceed the threshold of |0.1|, which has been proposed as a benchmark for covariate imbalance (Normand et al., 2001).Thus, our initial empirical findings provide support for Hypothesis 1.

Dep. Var.: Entry1927	1.	2.
South	0.845***	0.780***
	(0.265)	(0.291)
Spin-Offs		0.586
		(0.786)
Reentrants		1.754***
		(0.571)
Diversifier*Agricultural Implements		0.878***
		(0.309)
Diversifier*Vehicle Producers		0.0291
		(0.345)
Diversifier*Engine Producers		-1.376***
		(0.502)
Diversifiers*Others		-0.0625
		(0.302)
Const	-0.152	-0.485
	(0.175)	(0.300)
N	246	246
Events	137	137
AIC	331.4	313.3
BIC	338.4	341.3
Log-likilhood	-163.678	-148.638
p>chi2	0.0014	0.0000

Standard errors in parentheses
* p<.1, ** p<.05, *** p<.01

Table 3.4: Models 1-2.

	before weighting			after weighting		
	mean entry<=1927	mean entry>1927	standardized differences	mean entry<=1927	Mean entry>1927	standardized differences
South	0.55	0.23	-0.637	0.42	0.41	-0.008
Spin-Offs	0.04	0.03	-0.79	0.04	0.04	0.016
Reentrants	0.18	0.05	-0.352	0.12	0.11	-0.024
Diversifier*Agricultural Implements	0.42	0.28	-0.299	0.36	0.36	0.011
Diversifier*Vehicle Producers	0.22	0.27	0.113	0.23	0.24	0.011
Diversifier*Engine Producers	0.04	0.17	0.635	0.09	0.10	0.056
Diversifiers*Others	0.43	0.53	0.204	0.50	0.49	-0.024

Table 3.5: Standardized mean differences before and after propensity score weighting

These findings imply that "market-entry selection bias" is a relevant concern in our sample. In order to account for "market-entry selection bias", we estimate firms' $\hat{e}_i(v)$ with the help of Model 2 from Table 3.4 and create propensity score weights. Standardized differences of all observations in our sample after weighting are shown in Table 3.5. All values are far below |0.1|, which indicates that after weighting our sample is almost entirely balanced with regard to pre-entry backgrounds.

In the next step, weighted complementary log-log hazard rate regressions with normalized weights, as well as analogous non-weighted models, are estimated to test Hypotheses 2a-3b. (Tables 3.6 and 3.7). As described above, output volumes in the farm tractor market reached a considerable size, and the struggle for market dominance via scale advantages set in only after the emergence of the new southern submarket in 1927. Before this time, much of the accumulated experience with earlier tractor versions in the North was of little relevance with respect to both technology and customer demand in the larger southern market. The relevant post-entry accumulation of industry-specific knowledge only started after 1927. New entrants were still able to compete with incumbents on equal terms at this time. If they could draw on relevant pre-entry experience, they could even be in an advantageous position. On this basis, no systematic advantages for early entry are expected to be found. We also expect that for the post-1927 entrants, a background in related markets was more important in reducing exit hazards than experience in technologically related industries. Given their familiarity with regional markets, we also expect to find that post-1927 entrants located in southern Germany have a lower exit hazard than entrants from northern Germany.

Without controlling for the endogeneity of entry times, we find that post-1927 entrants and firms with pre-entry experience were systematically more long-lived than earlier and inexperienced peers (Models 3 and 4). In Models 5 and 8 we find that experience has a stronger effect on later entrants. Controlling for endogeneous timing of entry in the weighted regressions, the effect of entering after 1927 on performance is no longer significant (Models 6 and 7). These findings are consistent with Hypothesis 2a-b.

Models 9-12 (Table 3.7) provide a more detailed analysis of the associations between specific pre-entry backgrounds and exit hazards. In line with the predictions

of Hypothesis 3a, we find that entrants whose resources and capabilities best matched the requirements of the market on average were more long-lived. Specifically, being located in the South or diversifying from agricultural implements is associated with a lower hazard, but only for post-1927 entrants when market-related capabilities were of the utmost importance (Model 12). None of the other types of industry experience provided late entrants with specific competitive advantages. If anything, Model 12 is suggestive of technological capabilities enhancing the performance of early diversifiers from the vehicle industry. These patterns are consistent with the predictions of Hypothesis 3a. In all models (with or without correcting for endogenous timing of entry, with or without interaction terms for late entrants) we find robust evidence of performance effects for only three types of backgrounds: intra-industry experience accumulated by re-entrants and spin-offs, as well as experience in agricultural implement markets brought by the respective group of diversifiers. This finding corroborates Hypothesis 3b.[14]

[14] As a robustness check, we also estimated hazard rate regressions with a time-varying dummy measuring whether firms participated in the German farm tractor industry when the submarket of the multipurpose farm tractor started to boom in 1935 (Bauer 1987; 1995), instead of a dummy representing entry after 1927. Results, which are very similar to those reported above, may be obtained from the authors upon request.

	non weighted			weighted		
Dep.Var.: Hazard Rate	3.	4.	5.	6.	7.	8.
Entry 1927	-0.501***	-0.438**	1.013*	-0.293	-0.228	0.978*
	(0.172)	(0.175)	(0.570)	(0.192)	(0.193)	(0.551)
Experienced		-1.036***	-0.798***		-1.115***	-0.842***
		(0.279)	(0.291)		(0.262)	(0.278)
Experienced*Entry 1927			-1.505***			-1.268**
			(0.581)			(0.569)
2WW	-1.242***	-1.225***	-1.224***	-1.422***	-1.394***	-1.398***
	(0.217)	(0.215)	(0.219)	(0.241)	(0.237)	(0.243)
log(MDEN)	-0.933**	-0.754	-0.767	-0.945**	-0.706	-0.729
	(0.452)	(0.476)	(0.468)	(0.480)	(0.517)	(0.507)
log(MDEN)^2	0.192**	0.167**	0.166**	0.175*	0.139	0.139
	(0.0821)	(0.0849)	(0.0837)	(0.0908)	(0.0947)	(0.0932)
Log(RegDEN)	-0.0963	-0.146	-0.127	-0.135	-0.205	-0.181
	(0.112)	(0.114)	(0.114)	(0.130)	(0.129)	(0.131)
NRegDEN	1.198	1.111	1.395	1.480	1.551	1.820
	(1.546)	(1.612)	(1.561)	(1.699)	(1.754)	(1.688)
ARegN	0.0157	0.00576	0.00857	0.0151	0.00885	0.0112
	(0.0132)	(0.0150)	(0.0143)	(0.0127)	(0.0138)	(0.0131)
T	-0.0549***	-0.0508***	-0.0497***	-0.0652***	-0.0601***	-0.0591***
	(0.0140)	(0.0141)	(0.0140)	(0.0138)	(0.0139)	(0.0138)
T^2	0.000535**	0.000488**	0.000469**	0.000589***	0.000535**	0.000516**
	(0.000222)	(0.000226)	(0.000227)	(0.000206)	(0.000211)	(0.000211)
Const	-0.865	-0.382	-0.496	-0.648	-0.247	-0.353
	(0.643)	(0.674)	(0.654)	(0.625)	(0.711)	(0.683)
N	246	246	246	246	246	246
Fails	217	217	217	217	217	217
AIC	1376.7	1366.9	1364.4	2648.3	2620.7	2614.1
BIC	1435.7	1431.8	1435.2	2707.2	2685.6	2684.8
log-liklihood	-678.370	-672.442	-670.196	-1314.129	-1299.372	-1295.167
p>chi2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Standard errors in parentheses

* p<.1, ** p<.05, *** p<.01

Table 3.6: Models 3-8.

	non weighted		weighted	
Dep. Var.: Hazard Rate	9.	10.	11.	12.
Entry 1927	-0.215	0.0566	-0.198	0.194
	(0.203)	(0.383)	(0.217)	(0.427)
South	-0.288	0.0602	-0.175	0.323
	(0.193)	(0.267)	(0.214)	(0.293)
Spin-Offs	-0.954***	-1.135***	-1.012***	-1.429***
	(0.211)	(0.287)	(0.213)	(0.264)
Reentrants	-1.039***	-1.293*	-1.017***	-0.944**
	(0.297)	(0.771)	(0.337)	(0.479)
Diversifier*Agricultural Implements	-0.947***	-0.404*	-0.810***	-0.118
	(0.170)	(0.235)	(0.193)	(0.265)
Diversifier*Vehicle Producers	-0.335*	-0.627***	-0.293	-0.561**
	(0.173)	(0.226)	(0.190)	(0.284)
Diversifier*Engine Producers	-0.177	-0.258	-0.158	-0.405
	(0.189)	(0.224)	(0.280)	(0.266)
Diversifiers*Others	-0.272	-0.357	-0.283	-0.537**
	(0.167)	(0.222)	(0.188)	(0.247)
South*Entry 1927		-0.620*		-1.092***
		(0.364)		(0.416)
Spin-Offs*Entry 1927		0.0318		0.510
		(0.436)		(0.463)
Reentrants*Entry 1927		0.147		-0.216
		(0.866)		(0.643)
Diversifier*Agricultural Implements*Entry 1927		-0.920***		-1.223***
		(0.331)		(0.376)
Diversifier*Vehicle Producers*Entry 1927		0.629*		0.748*
		(0.355)		(0.401)
Diversifiers*Engines*Entry 1927		0.500		0.986
		(0.551)		(0.653)
Diversifier*Others*Entry 1927		0.0146		0.290
		(0.341)		(0.381)
2WW	-1.234***	-1.363***	-1.451***	-1.751***
	(0.205)	(0.217)	(0.233)	(0.273)
log(MDEN)	-0.620	-0.649	-0.580	-0.570
	(0.470)	(0.480)	(0.479)	(0.486)
log(MDEN)^2	0.155*	0.159*	0.123	0.119
	(0.0833)	(0.0847)	(0.0888)	(0.0888)
Log(RegDEN)	-0.0621	-0.0451	-0.135	-0.0456
	(0.115)	(0.124)	(0.130)	(0.149)
NRegDEN	1.880	3.176*	1.846	4.286**
	(1.738)	(1.728)	(2.001)	(1.778)
ARegN	0.00732	0.00836	0.0104	0.0112
	(0.0159)	(0.0170)	(0.0155)	(0.0163)
T	-0.0382**	-0.0331**	-0.0521***	-0.0394***
	(0.0159)	(0.0154)	(0.0151)	(0.0149)
T^2	0.000414	0.000372	0.000521**	0.000371
	(0.000268)	(0.000255)	(0.000241)	(0.000242)
Const	-0.788	-0.769	-0.619	-0.581
	(0.693)	(0.704)	(0.682)	(0.695)
N	246	246	246	246
Fails	217	217	217	217
AIC	1350.0	1349.9	2591.2	2545.7
BIC	1450.3	1491.5	2691.4	2687.2
Log-likilhood	-657.989	-650.961	-1278.577	-1248.835
p>chi2	0.0000	0.0000	0.0000	0.0000

Standard errors in parentheses

* p<.1, ** p<.05, *** p<.01

Table 3.7: Models 9-12.

3.6 Discussion and conclusion

In this chapter we study the relationship between entry timing, pre-entry experience and post-entry performance in industry evolution. Analyzing entry and firm survival in the historical German farm tractor industry, we found empirical support for the conjecture that entry timing is endogenous and reflects entrants' attempts to find the best match between capability endowments and market requirements. The emergence of a new tractor submarket after 1927 induced a new wave of entry, which was predominately composed of southern firms diversifying from agricultural backgrounds. With their market-related knowledge, these new entrants were well-positioned to succeed in the newly emerging submarket. They subsequently outperformed the earlier entrants into the industry.

Our finding that late diversifiers with market-related knowledge were more likely than early entrants to survive the shakeout in the German farm tractor industry resonates with recent work by Ulaga and Reinartz (2011) who identify a product sales force and distribution network as a critical resource of manufacturing firms. Among the critical resources and capabilities identified by these authors is personal selling, which presumably provided a distinct advantage for regional producers in the dominant southern submarket. Hybrid sales offerings and deployment capabilities are also suggested as being important (Ulaga and Reinartz, 2011). In this regard, the idea that there was a competitive advantage for agricultural implement producers, which would be able to provide complementary equipment for the multipurpose farm tractors, is plausible. The competitive relevance of sales capabilities and presence in horizontally related sales markets, as suggested by Ulaga and Reinartz (2011), is consistent with the account provided by Buenstorf (2008) of the large number and competitive success of diversifiers from agricultural implements in the U.S. farm tractor industry.

How much we generalize from the above analysis of a single historical industry? In some industries a single submarket dominates over the entire evolution of the industry, and hence no technological discontinuities are observed. Penicillin and TV receivers have been suggested as cases in point (Bhaskarabhatla and Klepper, 2009). However, numerous industries other than the German farm tractor industry have experienced technological discontinuities. Future research should focus on these industries in order to paint a more complete picture of the interplay between endogenous entry timing and firm success.

In a similar vein, our study does not explain whether and how entry or incumbency shapes technological discontinuity in the German farm tractor market. Recent research by Sood and Tellis (2011) shows that technological disruptions are mainly introduced by incumbents. However, even incumbents may possess the right capabilities to introduce a technological discontinuity as well as the ability to deploy it.

Another limitation, generally valid in industry evolution studies, refers to the demand side (Adner, 2002). The question how the new submarket gained dominance among the small scale farmers in southern Germany remains undisclosed because of insufficient data. Future research may therefore focus on both the supply and demand side of industry evolution, beyond anecdotal evidence.

When looking at the increasing product heterogeneity in contemporary markets, we would suspect that early entry is no guarantee in general for success any more (if it ever was). In this respect, from the example of the historical tractor industry, lessons can be drawn both for practitioners and for researchers. For practitioners, our study suggests the importance of entry timing as an object of strategic management. Changing markets may provide opportunities to new entrants well after the first wave of entry into this market. Postponing entry may not simply come at a cost of foregoing experiential learning but may also have a positive option value. Strategic decision making should then try to balance the costs and benefits of waiting.

For researchers, our study holds the message that special attention needs to be paid to the existence and emergence of submarket structures within industries e.g. when investigating entry barriers and entry decisions. Further empirical investigations should pay increased attention to the *interplay* of entry timing decisions and pre-entry capabilities of market entrants along the life cycle, instead of treating them separately. It is the joint examination of changing market conditions and the endogenous entry timing decision that serves to capture the main determinants of individual firm survival and industry evolution.

4 Chapter: Innovation, personality traits and entrepreneurial failure

4.1 Introduction

Regardless of the recent growing interest in investigating entrepreneurial failure (Wiklund and Shepherd, 2011; Rauch and Rijsdijk, 2012), empirical investigations on the subject are rare (Cardon et al., 2011). Failure causes financial loss, grief to the entrepreneur (Shepherd et al., 2009) and affects social welfare (McGrath, 1999). The reasons for entrepreneurial failure correspond either to external factors, in other words, entrepreneurs are "unlucky" (Hall, 1992, p. 239, see also Everett and Watson, 1998; Watson and Everett, 1999), or to individual aspects of the entrepreneur and his firm (Hall, 1992; Everett and Watson, 1998).

One important internal factor affecting failure is innovation (Berggren and Nachher, 2001; Rosenbusch et al., 2010). Innovative entrepreneurship usually displays a higher degree of uncertainty than non-innovative entrepreneurship (McGrath, 1999). Uncertainty in innovative entrepreneurship mainly stems from the entrepreneurial firms' liability of newness (Aldrich and Auster, 1986; Suchman, 1995; Garonne and Davidsson, 2010; Semasinge et al., 2011). Despite the existence of a broad agreement on the positive relationship between innovation and entrepreneurial performance (see Rosenbusch et al., 2010), the effect of innovation on entrepreneurial failure is less well-established. However, answering the question whether innovation is a promising strategic choice for start-up entrepreneurs may help to avoid failure.

Moreover, also referring to internal aspects, the personality traits of the entrepreneur may explain entrepreneurial failure (Shepherd and Wiklund, 2006). Nevertheless, although personality traits have been observed to have a direct effect on entrepreneurial performance measures (Ciavarella et al., 2004; Baron and Markman, 2005; Rauch and Frese, 2007a; Zhao et al. 2010), those effects are, at most, moderate (Rauch and Frese, 2007; Zhao et al., 2010). However, personality traits are proposed to moderate the successful implementation of innovations (Rank et al., 2004; Bledow et al., 2009) and thus may indirectly affect entrepreneurial failure. We use the Big Five personality traits consisting of conscientiousness, extraversion, openness, agreeableness and neuroticism (Digman, 1990; Barrick and Mount, 1991; Costa and McCrae, 1995) to probe their moderating effect on the

relationship between innovation and entrepreneurial failure. Particularly, extraversion (Rank et al., 2004) and conscientiousness are attributed to have a positive influence on innovation implementation, while openness is inimical (Bledow et al., 2009).

Consequently, the reason why innovation is volatile with respect to entrepreneurial performance or failure may be explained by the personality traits of the implementing entrepreneur. Thus, investigating the moderating effect of personality traits on the innovation failure relationship may help to draw some conclusions on the risky nature of innovations in entrepreneurship research.

Our study contributes to the literature on the personality performance relationship in entrepreneurship (Rauch and Frese, 2007a; Zhao et al. 2010), in which moderating effects of personality on failure are an under-investigated phenomenon. Moreover, a striking shortcoming in studies that employ venture survival as a performance measure is neglecting reasons beyond failure that lead to ceasing entrepreneurial activities within a firm (Wennberg et al., 2010; Amaral et al., 2007; Headd, 2003). For instance, bankruptcy is not the only reason to depart from a business but also a successful sale.

Another contribution of the present study is the consideration of self selection bias into innovative entrepreneurship when measuring the effect of innovation on entrepreneurial failure. Evidence on the effect of innovation on firm performance that takes self selection bias into account is scarce. We utilize sub-classification on the propensity score to control for entrepreneurial characteristics that determine self selection into innovative entrepreneurship. Therefore, our study design allows our results to be interpreted as causal, given the made assumptions hold true.

In conclusion, there is a lack of evidence regarding the effect of innovation on entrepreneurial failure. Moreover, to the best of our knowledge, the moderating effect of personality on the innovation failure relationship has not yet been investigated in entrepreneurship research. We therefore attempt to shed some light on the questions: (1) “Which effect has innovation on entrepreneurial failure if observed endogeneity is considered?” (2) “Which Big-Five personality traits moderate the effect of innovation on entrepreneurial failure?” and follow Sarasvathys’ (2004) call to link specific performance measures to the characteristics of specific subgroups of entrepreneurs.

To answer these questions, we identify entrepreneurial failure with the help of external bankruptcy information and self-reports, as entrepreneurial failure is not to

the same as entrepreneurial exit (Everett and Watson, 1998; Wiklund and Shepherd, 2011). We use a dataset consisting of 423 entrepreneurs. Their innovativeness is assessed through self-reports on the question whether the business idea is based on an innovative product or process. We only investigate entrepreneurs that operate with their firms in industries in which companies on average spend more than 3.5% of their turnover on R&D (see Grupp and Legler, 2000).

We suggest that some of the Big Five personality traits may affect the entrepreneurial firms' liability of newness and the propensity to implement innovations properly. Innovative firms in general face a higher liability of newness. The firms' liability of newness is decisive in explaining entrepreneurial success and failure. Consequently, we propose that a firms' liability of newness may account for divergent effects of personality traits on failure with innovative compared to non-innovative firms. Moreover, we test the effect of external cost and revenue shocks on entrepreneurial failure, which is empathically suggested by the literature (Hall, 1992; Everett and Watson, 1998; Watson and Everett, 1999; Carter and Van Auken, 2006).

In the following section we outline the term of entrepreneurial failure that is utilized. This is necessary in order to assess a clear-cut outcome variable within our analytical framework. In the Section 4.3, the relationship between external cost and revenue shocks on failure is discussed. In the Section 4.4 the effect of innovation on entrepreneurial failure is treated. The Section 4.5 theoretically treats the relationship between innovation, the Big Five traits extraversion, conscientiousness and openness and entrepreneurial failure. In the Section 4.6, we present our dataset consisting of more than 400 start-up entrepreneurs from the German federal state of Thuringia. Subsequently, our estimation strategy, which is based on sub-classification on the propensity score and survival analysis, is disclosed. The Section 4.7 deals with the results of our analysis and in the Section 4.8 we discuss our findings. Our conclusions are then presented at the end.

4.2 Definition of entrepreneurial failure

Focusing on entrepreneurial failure, we first have to discuss what we mean by that term. Many studies employ entrepreneurial exit as a proxy for failure. However, even businesses considered as financially successful sometimes cease (Gaskill and Van Auken, 1993; Gimeno et al., 1997; Headd, 2003; Bates; 2005) or see their

owners leave. For example, entrepreneurs may decide to withdraw if they have a preference for more leisure time (Shane and Venkataraman, 2000), have problems with their health, or decide they have earned enough money. Additionally, Bates (2005) argues that entrepreneurial exit is also driven by higher opportunity costs for other activities or projects. Thus, entrepreneurial exit is apparently not a proper indicator for entrepreneurial failure.

Zacharakis et al (1999; see also Shepherd, 2003) consider only bankruptcy of an owner-manager's firm to be entrepreneurial failure. In this spirit, Kato and Honjo (2010) in their study on firm survival distinguish between bankruptcy, voluntary liquidation and merger. However, even among these exit categories a mixing up of failures may occur, with successful withdrawals within the respective non-bankruptcy categories. More precisely, mergers might be driven by poor business expectations or a meagre performance of one of the merged firms (Wiklund and Shepherd, 2011), and a voluntary firm liquidation must not necessarily be a successful one (Wennberg et al., 2010).

For all of these reasons, we instead stick with the definition by Gaskill and Van Auken (1993, p. 21). They see business failure as "…wanting or needing to sell or liquidate to avoid losses or to pay off creditors or general inability to make a profitable go of the business". As entrepreneurs are the architects of their businesses (Sarasvathy, 2004), we assume that their personality affects failure (see Shepherd and Wiklund, 2006). In order to meet this definition and to consider only exits driven by a low economic performance of the owned firm, we exclude exits that are not forced by failure and recode them as "not failed".

As mentioned above, entrepreneurial failure is caused by internal as well external factors. We hence discuss external cost and revenue shocks as a driver of failure in the next section.

4.3 External shocks and entrepreneurial failure

In their study on small business failure, Everett and Watson (1998) find that 30-50% of small business failures are related to developments in the external environment. Cost and revenue shocks are especially attributed to business failure, while the individual entrepreneur has no impact on those effects. Failure because of cost and revenue shocks hinges on the internal fixed cost structure of firms. As fixed

costs are usually established on past developments, cost or revenue shocks may bring firms into financial trouble (Hall, 1992). Cost and revenue shocks originate either from developments within the firms' industry or the economy as a whole. However, industry cost or revenue shocks regularly have a higher impact on firm failure (Everett and Watson, 1998). We thus propose the following hypothesis:

Hypothesis 1: Industry related cost or revenue shocks contribute to entrepreneurial failure in highly innovative industries.

Besides external factors, entrepreneurial failure is endogenously affected by entrepreneurial qualities. In the next section, the links between innovation, personality and entrepreneurial failure are illustrated. In a first step, the direct relationship between an innovation strategy and entrepreneurial failure is discussed. Subsequently, how the entrepreneurs' personality affects the tendency to fail is examined. And finally, the moderating effect of innovation on the personality failure relationship is described.

4.4 Innovation and entrepreneurial failure

In the following, innovation refers to the introduction of a new product, service or process into a market by an entrepreneurial firm (see Utterback and Abernathy, 1975). Recent meta-analytical evidence suggests that small firm performance and innovativeness share a positive relationship, though this result is moderated by contextual variables (Rosenbusch et al., 2011). In general, innovations establish a monopoly for entrepreneurs and thus create substantial revenue potential (Schumpeter, 1911). Particularly entrepreneurs with young and small firms possess advantages in commercializing innovations, because their activities are hardly visible by established competitors (Carayannopoulos, 2009). Consequently, innovators build up advantages by forestalling competitors in acquiring rare assets as well as attracting a customer base (Lieberman and Montgomery, 1988). Likewise, innovative firms gain competitive advantages over their competitors through competencies and resources that are hardly duplicable (Teece et al., 1997). Finally, innovations create unique organizational competencies and resources (Teece, 1996), which assure a competitive advantage (Peteraf, 1993).

On the other hand, entrepreneurs with innovative firms face a higher liability of newness[15] (Aldrich and Auster, 1986; Suchman, 1995; Shepherd et al., 2000; Garonne and Davidsson, 2010; Semasinge et al., 2011). This obstacle manifests in a lack of market awareness, uncertainty about the production process and in managing the new venture. Entrepreneurs who struggle to diminish their firms' liability of newness are more likely to fail. Diminishing a firms' liability of newness involves strategies like generating market awareness or substantial investments in marketing activities, raw materials, skilled staff, information, external consulting, organization building and generating deliverable products. Hence, acquiring the necessary resources is imperative to avoid failure for innovative entrepreneurs (Shepherd et al., 2000).

We nevertheless infer that the likelihood of entrepreneurial failure is decreased if entrepreneurs start up with innovative firms. The results of the meta-analysis of Rosenbusch et al. (2011) imply that innovation is on average positively related with firm performance and hence decreases the likelihood to fail. They find that altogether innovation increases the performance of small and medium firms and argue that advantages such as establishing a monopoly or entry barriers outbalance drawbacks like uncertainty. Therefore we propose:

Hypothesis 2: Innovation decreases the likelihood of entrepreneurial failure.

The next section deals with the relationship of personality and entrepreneurial failure.

4.5 The Big Five personality traits, innovation and entrepreneurial failure

4.5.1 The Big Five personality traits and entrepreneurial failure

The link between personality traits and entrepreneurial performance dimensions is well documented (Rauch and Frese, 2007a; Zhao et al., 2010). We draw upon the Big Five traits in order to measure personality. The Big Five comprises five broad personality factors, namely extraversion, agreeableness, conscientiousness, neuroticism and openness (Digman, 1990; Barrick and Mount,

[15] The concept of liability of newness was originally introduced by Stinchcombe (1965).

1991; Costa and McCrae, 1995). The Big Five personality factors are widely accepted in order to grasp the personality traits of an individual (Digman, 1990; Barrick and Mount, 1991; Barrick et al., 2003) Moreover, the Big Five dimensions are independent of cognitive dispositions (McCrae and Costa, 1987), robust across different cultures (McCrae and Costa, 1997; John and Srivastava, 1999) and relatively stable over time[16] (Costa and McCrae, 1992; Roberts and DelVecchio, 2000; Hampson and Goldberg, 2006). Secondly, it is broadly suggested that the Big Five personality traits predict essential differences in observed actions and reactions (McCrae and Costa, 1999). Although the Big Five cannot predict a person's actions in a particular situation, they are quite reliable in marking behavioural trends across different situations and over time (McAdams and Pals, 2006). Meta-analytical evidence by Zhao et al. (2010) points out that the Big Five traits openness, conscientiousness and extraversion positively relate with entrepreneurial performance. Contrarily, neuroticism is detrimental to entrepreneurial performance and agreeableness has no effect.

Studies that investigate the relationship between the Big Five and venture survival are given by Ciavarella et al. (2004) and Baron and Markman (2005). The results of the first refer to apparently non-innovative industries, whereas the last investigate entrepreneurs in innovative industries from a single technological domain. In both studies it is neither distinguished between different types of entrepreneurial exits nor between innovative and non-innovative entrepreneurs. Conscientiousness contributed to venture survival in both studies. The trait openness decreased survival prospects in Ciavarella et al. (2004) but not in Baron and Markman (2005). The other traits are not correlated to survival or, in case of agreeableness and neuroticism, not investigated by Baron and Markman (2005).

Rauch and Frese (2007a; 2007b) argue that broad personality traits have, at most, a moderate effect on entrepreneurial performance measures. Consequently, we expect only modest direct effects of the Big Five personality traits on entrepreneurial failure. It is also suggested that personality rather indirectly affects entrepreneurial performance measures (Jong et al., 2011), for instance through moderation effects (Rauch and Frese, 2007a; 2007b). Hence, we propose that personality can moderate

[16] Empirical evidence suggests that the Big Five are at least partly genetically determined (Jang et al., 1997). Hampson and Goldberg (2006) find a significant stability over forty years for all traits excepting neuroticism.

the relationship between innovation and entrepreneurial failure. In this vein, the Big Five traits extraversion, openness and conscientiousness are mentioned in affecting the effectual implementation of innovations (Rank et al., 2004; Bledow et al., 2009). We therefore discuss the moderating effect of those traits on the innovation entrepreneurial failure relationship in the next section.

4.5.2 The moderating effect of personality on the innovative entrepreneurship failure relationship

Innovative entrepreneurship is characterized by lacking information on customer behaviour, uncertainty regarding production processes or not assessable competition (Koellinger, 2008). Compared to imitative entrepreneurs, innovative entrepreneurs face different organizational settings (Samuelsson and Davidsson, 2009), tasks (Shepherd et al., 2000, Alvarez and Barney, 2005), and relationship requirements (de Jong et al., 2010). As implementing innovations properly requires certain behaviours and personality traits predict behaviour, the personality of people is linked with innovative behaviour and the effectual implementation of innovations (Miron et al., 2004; Bledow et al., 2009). On the other hand, as Bledow et al. (2009, p. 316) put it, "Individuals need to invest high regulatory effort to meet demands of innovation that are inconsistent with their disposition." This means that people with particular personality characteristics need to invest effort in changing their personality congruent behaviours in order to effectively implement innovations. Negative emotions in case of trait incongruent behaviour may explain this phenomenon (Moskowitz and Cote, 1995). Consequently, entrepreneurs who are disposed with a personality profile congruent with effectual innovation implementation are more likely to succeed. As a poor innovation implementation leads to entrepreneurial failure, we propose a moderating effect of personality on the relationship between innovative entrepreneurship and failure.

However, we do not expect a moderating effect of all of the Big Five personality traits. As entrepreneurial failure with an innovative business idea is mainly an innovation implementation but not a creation problem, the traits extraversion (Patterson, 2002; Rank et al., 2004) as well as openness and conscientiousness (Bledow et al., 2009) are proposed to be linked with the implementation process of innovations. Correspondingly, we derive hypotheses on

the moderating effect of extraversion, openness as well as conscientiousness on the relationship between innovation and entrepreneurial failure.

Extraversion. Extraversion is defined as "…an energetic approach toward the social and material world and includes traits such as sociability, activity, assertiveness, and positive emotionality" (John and Srivastava 1999). People high in extraversion are gregarious, assertive and outgoing (Zhao et al., 2010). Extraverted entrepreneurs thus have advantages in establishing and maintaining social networks with customers, financiers or other institutions (Ciavarella et al., 2004, Zhao and Seibert, 2006, Shane et al., 2010). Institutional linkages reduce the liability of newness of organizations (Baum and Oliver, 1991). Likewise, extraverts have a tendency to develop plots, emblems and connotations, which decrease the liability of newness of their entrepreneurial firms (Patel and Thatcher, 2012). The social abilities of extraverts also promote the sourcing of financial and other resources, which is particularly important in exploiting innovations and avoiding failure (Choi and Shepherd, 2004).

In addition, the successful implementation of innovations requires a high degree of personal initiative (Rank et al., 2004, Miron et al., 2004). From the Big Five personality traits, extraversion is most strongly linked with personal initiative (Fay and Frese, 2001). Personal initiative enhances idea communication of the innovation (Frese, 2000). Moreover, initiative is linked with acquiring information, avoiding negative outcomes and sustaining despite obstacles (Frese et al., 1996), which is conductive for implementing innovations successfully (Baer and Frese, 2003).

In conclusion, beyond the positive aspects, innovation leads to liabilities of newness, which may increase the likelihood of failure. As extraversion is linked with behaviours that decrease liabilities of newness particularly related with market awareness and uncertainty in production as well as management, this trait assures a more effectual implementation of innovations. Thus, we suggest that extraversion moderates the relationship between innovation and entrepreneurial failure. More precisely, extraversion strengthens the negative effect of innovation on entrepreneurial failure. And thus we propose the following hypothesis:

Hypothesis 3: Extraversion moderates the negative effect of innovation on entrepreneurial failure such that the relationship is stronger for higher levels of

extraversion and weaker for lower levels of extraversion.

Openness. A person's openness covers "…the breadth, depth, originality, and complexity of an individual's mental and experiential life" (John and Srivastava 1999). This trait relates positively with opportunity recognition (Ciavarella et al., 2004; Zhao et al., 2010), which is in general a prerequisite of successful entrepreneurship (Baum et al., 2001).

On the other hand, entrepreneurs high in openness have difficulties concentrating on a single area and being focussed due to their preference for variety (Ciavarella et al., 2004, Baron and Markman, 2005). Open people also render a preference for non-conformity (McCrea, 1994). Hence, openness entails characteristics that work detrimentally against the thorough implementation of innovations (Bledow et al., 2009).

For instance, firstly, innovation performance requires conformity in order to provide a high product quality (Miron et al., 2004). Secondly, entrepreneurs need to focus on the generation of profits and cash flows, which is crucial especially for innovative small businesses. In more detail, innovative small businesses struggle more in generating external funding than non-innovative and thus frequently have a finance gap (Hall and Lerner, 2010). Thirdly, the preference of open entrepreneurs for new experiences, novel ideas and progressive action (Zhao and Seibert, 2006, Zhao et al., 2010) may increase the uncertainty in the production process and management of an innovative start-up. And finally, concentrating solely on the novel aspects of opportunities distracts entrepreneurs from the operability and economic capacity of innovations (Baron and Ensley, 2006).

All these aspects lead to higher uncertainty in managing a venture and in the production process when an innovation is implemented by a start-up. Correspondingly, the liability of newness through innovations is amplified by openness. Hence, openness weakens the negative effect of innovation on entrepreneurial failure. Consequently, we hypothesize:

Hypothesis 4: Openness moderates the negative effect of innovation on entrepreneurial failure such that the relationship is weaker for higher levels of openness and stronger for lower levels of openness.

Conscientiousness. Conscientiousness is "…a socially prescribed impulse control that facilitates task- and goal-directed behavior, such as thinking before acting, delaying gratification, following norms and rules, and planning, organizing, and prioritizing tasks." (John and Srivastava, 1999). Conscientious entrepreneurs are achievement motivated, persistent, thorough and diligent (Ciavarella et al., 2004; Zhao and Seibert, 2006; Zhao et al., 2010). These qualities are especially important when it comes to the implementation of innovative business ideas (Amabile, 1983), because they may help to decrease liabilities of newness in the production process and in managing innovative start ups. Innovative product success furthermore strongly relies on product quality (Cooper, 1979). An important work performance facet of conscientiousness is to be quality driven (Robertson et al., 2000). Thus, again, conscientiousness seems to be a trait which is predestined in decreasing a start-ups' liabilities of newness regarding the production process when it comes to innovation implementation.

As decreasing liabilities of newness helps the hampering detrimental effects of innovation, conscientiousness is supposed to be an imperative for successful innovation implementation (Bledow et al., 2009). In turn, conscientiousness may strengthen the negative effect of innovation on entrepreneurial failure. Hence, we propose:

Hypothesis 5: Conscientiousness moderates the effect of innovation on entrepreneurial failure such that the relationship is stronger for higher levels of conscientiousness and weaker for lower levels of conscientiousness.

In the next section, the data and our estimation strategy for testing the above hypotheses is introduced.

4.6 Data and empirical methods

4.6.1 Sample and data selection

The data for this study stems from the Thuringian Founder Study, which is a project on the success and failure of solo or team entrepreneurs in the East German Federal State of Thuringia. The focus in this study was on innovative industries; "advanced technology" and "technology-oriented services" companies according to

the Centre for European Research (ZEW) classification (Grupp and Legler, 2000). All entrepreneurs in our dataset operate in industries in which on average more than 3.5% of the turnover is spent for R&D. The study draws from a population of 4,215 founders who registered a new entry in the commercial registry in Thuringia between 1994 and 2006. This was the basis of a random sample of 2,606 start ups. From this random sample, 639 face-to-face interviews were realized (response rate 25%) between January and August 2008. The data contains more than 200 socio-economic and psychological variables of the founders and their (team) ventures, like age, education, vocational experience, gender, industry classification of the firm, their Big Five personality scale etc. If there was a team founding, the lead founder was interviewed.

Altogether, we dropped 223 observations because of missing values[17]. The remaining sample size then comprised 416 observations, of which 95 (co-)founders had ceased their entrepreneurial activity by 2008. In our study, we consider entrepreneurial exit following DeTienne (2010) as "…the process by which the founders of privately held firms leave the firm they helped to create; thereby removing themselves…from the primary ownership and decision-making structure of the firm".

4.6.2 Dependent variable: Hazard rate of entrepreneurial failure

Considering our dataset, the most appropriate empirical method to investigate entrepreneurial failure is duration analysis. The time of entrepreneurial activity is the most precise indicator to measure entrepreneurial failure in our sample. We quantify the duration of entrepreneurial activity from the time when the observed entrepreneur started his business until he withdrew from managing his own firm. The duration is measured in years. Furthermore, entrepreneurial failure is present if the remaining firm can be classified as economically not successful. We estimate the hazard rate to test our hypotheses, which is the instantaneous probability of failing, given that an entrepreneur has maintained his activities until the current period.

Following our definition of failure above, we classify entrepreneurial failure

[17] 37 observations were deleted due to a poor interview quality, 19 because of missing data and 70 firms turned out to be no original start-ups (for instance, they were a new subsidiary of an existing firm). Moreover, 96 start-ups that were launched earlier than 1994 are not recognized. The intention behind this measure was to minimize the effects of German reunification.

due to Watson and Everett (1996). Accordingly, failure is at hand either if (1) the left firm was filed for bankruptcy, (2) the leaving entrepreneur wanted to prevent further losses or (3) the leaving entrepreneur did not "make a go" of the firm. With the help of Credit reform, which is the leading rating agency for firms in Germany, we find 46 bankruptcies at the time of exit among the 95 exits in our sample. The remaining 49 firms kept their dates of payment at the time of entrepreneurial exit. Nevertheless, as even underperforming firms remain in operation through personal financial investments of their owners (van Witteloostuijn, 1998; Shepherd et al., 2009), losses to creditors are not sufficient to display failure. Thus, exited entrepreneurs in our sample were additionally asked why they left their firms. Multiple answers were possible. Exit due to prevent further losses was measured with "I lost too much money" (1=Yes or 0=No, 23 cases) and exit because there was an inability to "make a go" of the business was measured with "The firm did not develop like I expected it" (1=Yes or 0=No, 41 cases). An overview of the interrelations of our indices is given in Table 4.1. Altogether, 72 out of 95 exits are classified as failures as they were either due to bankruptcy, prevent further losses or an inability to "make a go" of the venture. In other words, in case that one of the three mentioned failure indicators was fulfilled, we classified the exit as a failure (see Watson and Everett 1996). The remaining 23 entrepreneurs that resign from apparently economic healthy ventures are coded as censored.

	1.	2.	3.	1., 2. or 3.
1. Bankruptcy/losses of creditors	46			
2. "I lost too much money"	12	23		
3. "The firm did not develop like I expected it"	19	13	41	73

Table 4.1: Indicators of entrepreneurial failure and their interrelations

4.6.3 Explanatory variables: External cost and revenue shocks, innovativeness and the Big Five personality traits

External cost or revenue shocks may be proxied by changes of the average profit margin in the respective industry. We approximate this measure with the growth rate of the ratio of gross operating surplus to production value at the NACE-2-digit level, which is both provided by the Statistical Office Germany. This measure is used in a time-varying fashion (IND_PRO_GRO).

We measure innovativeness with the help of the item "Compared to your competitors, your business idea is based on a product or service that is new, qualitatively better, has a higher value or could be faster or cheaper produced" (INNO, 1=YES, 0=NO).

The Big Five personality traits are quantified with 45 items (Ostendorf, 1990). Each of the Big Five personality factors is measured by nine German bipolar adjective pairs on a six-point Likert scale (0–5). For all of the Big Five personality traits, a score closer to five represented a higher value in the concerning trait. According to the definitions above, we include variables of conscientiousness (alpha=.82), extraversion (alpha=.72), agreeableness (alpha=.73), openness (alpha=.57) and neuroticism (alpha=.78). A principal component factor analysis with promax rotation indicates that the items for the respective Big Five factor which we utilize actually form five independent personality factors in our sample (see Table B.1 Appendix B).

4.6.4 Estimation strategy

We apply the Cox approach (Cox, 1972) to estimate respective (semi-)parametric hazard rate models. Nonetheless, innovative entrepreneurship is hardly a random event, which is independent of the qualities of the entrepreneur and his firm (Cohen and Levinthal, 1990; Zahra and George, 2002; Baron and Tang, 2011). Hence, the risk of sample selection bias (confounding) is given if non-innovative entrepreneurs have other characteristics than innovative entrepreneurs (see Dehejia and Wahba; 2002).

Methods based on the propensity score, which is the conditional probability to assign a treatment given a vector of observables, are useful to overcome sample selection bias (Rosenbaum and Rubin, 1983). In our case, stratification on subclasses of the entrepreneurs' propensity score to innovate correct for sample selection bias in Cox regressions (Rosenbaum and Rubin, 1984; Stukel et al., 2007). In the frequently used propensity score matching approaches some of the observations are discarded. Thus, stratification on subclasses of the propensity score is more appealing concerning our data, due to the moderate number of failures at hand.

Stratification on subclasses balances the observations in our sample in a way that the distribution of the observed properties is equal for innovative and non-

innovative entrepreneurs (Rosenbaum and Rubin, 1984; Steiner and Cook, in press). Cochran (1968) shows that stratifying on 5 subclasses removes approximately 90% of sample selection bias. Given that all confounding factors are represented with the propensity score, stratification is correct for almost all confounding (Imbens, 2004). In order to fulfill our analysis, we process according to the following steps (see Stukel et al., 2007; Schafer and Kang, 2008; Steiner and Cook, in press).

First, we measure the propensity score to innovate by means of a logistic regression model. In line with Schafer and Kang (2008), we fit the propensity score model with variables that can affect both innovativeness and entrepreneurial failure. Therefore, in addition to the above introduced controls that are supposed to affect failure, we control for factors that are suggested to have an effect on innovativeness as well. Studies on determinants of innovation show that patents (Basberg, 1987), R&D (Rosenbusch et al., 2011) and human capital (Subramaniam and Youndt, 2005) affect innovation. Thus, we control for R&D activities before the first business year (R&D, 1=YES, 0=NO), the number of years of studying (STUY) and the number of years in self-employment (YEARS_SELFEMP). In addition, it is controlled for age (AGE), former industry experience (IND_EXP; 1=YES, 0=NO), industry (NACE2; 1=YES, 0=NO), whether the founded firm is an academic spin off (SPIN_OFF, 1=YES, 0=NO) and start up before the year 2002 (2002, 1=YES, 0=NO).

Secondly, observations are allocated to one subclass of equal range analog to their propensity scores. With the purpose in mind to fulfill one precondition for balancing within subclasses, it is tested whether the average propensity score of innovative and non-innovative entrepreneurs differs. The starting point is one subclass. If the propensity score within a subclass is significantly different, this subclass is split in half and is tested once more for balance in the propensity score. This procedure is continued until the propensity score within each stratum is statistically equal. Then it is tested whether the mean of every characteristic within a subclass is equal for innovative and non-innovative entrepreneurs. A two sided t-test with a significance threshold of 0.01 is utilized for balance testing (see Becker and Ichino, 2002; Imbens, 2004).

In a third step, we estimate a stratified Cox regression (see Wei et al., 1989; Lunn and McNeil, 1995) according to the generated subclasses. All standard errors are computed with robust covariance matrix estimators (see Lin and Wei, 1989). Estimations are undertaken with Stata. We use Becker and Ichinos' (2002) Stata

application pscore to estimate propensity scores. In addition, the Stata package pbalchk by Lunt (2009) is utilized for balance checking.

	Mean	Mean*	Mean#	SD	SD*	SD#	Max	Max*	Max#	Min	Min*	Min#
1. Conscientiousness	3.64	3.63	3.7	.592	.594	.579	4.89	4.89	4.78	0	0	2.33
2. Extraversion	3.2	3.2	3.16	.619	.623	.601	4.78	4.78	4.44	1.44	1.44	1.67
3. Agreableness	3.09	3.1	3.02	.574	.554	.664	5	5	4.44	.889	.889	1.22
4. Openness	3.18	3.17	3.24	.541	.542	.533	4.89	4.89	4.38	1.56	1.56	2.22
5. Neuroticism	1.36	1.37	1.34	.509	.498	.564	3.11	3.11	2.55	0	0	.222
6. AGE	39.7	39.4	41.3	9.49	9.52	9.3	67	63	67	18	18	25
7. STUY	4.6	4.56	4.78	2.76	2.64	3.26	14	13	14	0	0	0
8. YEARS_SELFEMP	2.47	2.13	4.07	4.34	4.06	5.24	34	34	26	0	0	0
9. R&D	.447	.419	.583	.498	.494	.496	1	1	1	0	0	0
10. IND_EXP	.822	.837	.75	.383	.37	.436	1	1	1	0	0	0
11. SIZE_TURN	.392	.413	.292	.489	.493	.458	1	1	1	0	0	0
12. TEAM	.68	.66	.778	.467	.474	.419	1	1	1	0	0	0
13. NACE2	.236	.221	.306	.425	.415	.464	1	1	1	0	0	0
14. SPIN_OFF	.113	.116	.097	.317	.321	.298	1	1	1	0	0	0
15. 2002	.757	.727	.903	.429	.446	.298	1	1	1	0	0	0
16. INNO	.808	.817	.764	.395	.387	.428	1	1	1	0	0	0

*indicates that observations not failed
#indicates that observations failed

Table 4.2: Summary statistics

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.
1. Conscientiousness	1.00																
2. Extraversion	0.18***	1.00															
3. Agreableness	0.11**	0.06	1.00														
4. Openness	0.12**	0.28***	0.03	1.00													
5. Neuroticism	-0.27***	-0.34***	-0.19***	-0.25***	1.00												
6. AGE	0.14***	0.05	0.14***	-0.05	-0.02	1.00											
7. STUY	-0.03	-0.10**	0.06	0.03	0.06	0.25***	1.00										
8. YEARS_SELFEMP	0.02	0.05	0.05	0.05	-0.04	0.16***	-0.15**	1.00									
9. R&D	-0.04	-0.05	0.01	0.14***	0.02	0.03	0.13**	0.09*	1.00								
10. IND_EXP	-0.01	-0.05	-0.05	0.02	-0.01	0.04	-0.00	-0.05	-0.02	1.00							
11. SIZE_TURN	0.02	-0.00	-0.09*	-0.10**	-0.07	-0.02	-0.10**	-0.00	-0.04	0.14***	1.00						
12. TEAM	-0.03	-0.02	0.04	-0.01	0.06	-0.03	0.11**	0.04	0.04	-0.02	0.09*	1.00					
13. NACE2	0.09*	0.05	0.07	-0.13**	0.01	0.16***	-0.06	0.03	0.04	0.02	0.15***	-0.04	1.00				
14. SPIN_OFF	-0.11	-0.06	0.09*	0.06	0.01	-0.05	0.23***	-0.06	0.24***	-0.09*	-0.13**	0.20***	-0.11**	1.00			
15. 2002	-0.06	-0.04	-0.05	-0.12**	0.02	-0.03	0.09*	-0.12**	-0.11**	0.02	-0.02	-0.04	0.02	-0.01	1.00		
16. INNO	0.05	0.10**	-0.02	0.05	-0.02	0.06	0.05	0.09*	0.27***	-0.12**	0.00	0.01	0.14***	0.10**	-0.15***	1.00	
17. FAIL	0.05	-0.03	-0.05	0.05	-0.02	0.07	0.03	0.17***	0.13**	-0.09*	-0.09*	0.10*	0.08	-0.02	0.16***	-0.05	1.00
		*p<.1	**p<.05	***p<.01													

Table 4.3: Correlation coefficients

4.7 Results

Table 4.2 shows summary statistics of our variables and Table 4.3 indicates the respective correlations[18]. The variable FAIL in our correlation table specifies all observations that failed in our sample. The estimation of the propensity score is depicted in Table 4.4. Table 4.5 shows the quantiles and the number of innovative and non-innovative entrepreneurs within each quantile. The total number of subclasses after utilizing the above introduced allocation algorithm is 4 (detailed test statistics on the balance of the propensity scores and characteristics within subclasses are obtainable upon request). Balancing statistics of entrepreneurial characteristics based on standardized differences (Austin, 2009) before and after sub-classification are shown in Table 4.6. After sub-classification, all of the standardized differences are below 0.1 and thus balancing between innovative and non-innovative entrepreneurs after stratification is corroborated (see Normand et al., 2001).

We employed five models which are listed in Table 4.7. Models 1-2 are unstratified specifications, whereas the Models 3-4 are stratified according to the balanced subclasses. All classified "fails" are counted as events. In Models 1 and 3 the main effect of innovation on failure is tested. Moreover, industry specific cost and revenue shocks are probed as well in the models 1 and 3. Models 2 and 4 are specified to test the moderating effect of extraversion, openness and conscientiousness on the relationship between innovation and failure.

External cost and revenue shocks significantly ($p < 0.05$) affect the likelihood to fail in Model 3, which is predicted by Hypothesis 1. Particularly, an increase of 100% in the industries ratio of gross operating surplus to production value decreases the hazard rate to fail by a factor of exp(-1.652). Model 3 also indicates a significantly negative effect of innovativeness on entrepreneurial failure ($p < 0.05$), which corroborates Hypothesis 2. According to the coefficient INNO, innovation decreases the likelihood to fail by a factor of exp(-0.717).

Regarding the moderating effect of personality, the Cox regression stratified on the balanced propensity score subclasses (Model 5) reveals that the hazard rate is significantly more negative for innovate entrepreneurs who are

[18] The summary statistics and correlation table does not include the variable IND_PRO_GRO as it changes every year in which the entrepreneur is operating. Thus such one-dimensional measures as correlation coefficients have no explanatory power.

extraverted ($p < 0.05$). This result is in line with Hypothesis 3. The hazard rate is decreased by a factor of exp(-1.040) with a one unit level increase in extraversion, if entrepreneurs innovate. Additionally, for innovative entrepreneurs a one level unit increase in openness significantly increases the hazard rate of failure ($p < 0.05$) by a factor of exp(1.259). Hence, Hypothesis 4 is supported. Finally, in contrast with Hypothesis 6, which suggests a negative interaction effect of innovation and conscientiousness, we find that the effect of innovation of entrepreneurial failure is positively affected by conscientiousness ($p < 0.1$) by a factor of exp(1.168). Consequently, Hypothesis 5 has to be rejected.

In order to check the robustness of our findings, we estimated standard errors on the base of 5000 bootstrap replications (see Efron and Tibshirani, 1994). The bootstrapped standard errors are slightly higher than the robust covariance estimations, which indicates that our p-values are relatively stable and not biased through outliers and sampling distribution assumptions.

Dep. Var.: Inno	1.
Conscientiousness	0.173
	(0.229)
Extraversion	0.438*
	(0.234)
Agreableness	-0.366
	(0.241)
Openness	-0.0754
	(0.275)
Neuroticism	0.0710
	(0.287)
AGE	0.00413
	(0.0150)
STUY	0.0621
	(0.0550)
YEARS_SELFEMP	0.0558
	(0.0343)
R&D	1.497***
	(0.354)
IND_EXP	-0.981**
	(0.435)
SIZE_TURN	0.0863
	(0.290)
TEAM	-0.0897
	(0.313)
NACE2	1.105***
	(0.400)
SPIN_OFF	0.823
	(0.595)
2002	-1.096***
	(0.400)
Constant	1.162
	(1.828)
N	416
Events	336
AIC	372.6
BIC	437.1

'*p<0.1;**p<0.05;***p<0.01

Table 4.4: Estimation of the propensity score

	INNO		
Inferior of block of pscore	0	1	Total
0	11	8	19
.5	40	68	108
.75	20	87	107
.875	9	173	182
Total	80	336	416

Table 4.5: Subclasses of the propensity score

	before stratification			after stratification		
	mean (INNO=1)	mean (INNO=0)	standardized difference	mean (INNO=1)	mean (INNO=0)	standardized difference
Conscientiousness	3.65	3.57	-0.137	3.65	3.64	-0.030
Extraversion	3.23	3.07	-0.253	3.23	3.19	-0.055
Agreableness	3.08	3.11	0.049	3.08	3.09	0.007
Openness	3.19	3.13	-0.113	3.19	3.16	-0.051
AGE	40.04	38.48	-0.163	40.04	40.06	0.002
STUY	4.67	4.29	-0.139	4.67	4.57	-0.035
YEARS_SELFEMP	2.65	1.71	-0.202	2.65	2.50	-0.032
R&D	0.51	0.17	-0.673	0.51	0.48	-0.064
IND_EXP	0.80	0.91	0.280	0.80	0.81	0.028
SIZE_TURN	0.39	0.01	-0.137	0.39	0.33	-0.022
TEAM	0.39	0.39	-0.011	0.39	0.39	-0.001
NUM_PAT	0.68	0.68	-0.014	0.68	0.67	-0.023
NACE2	0.26	0.11	-0.345	0.26	0.25	-0.034
NACE3	0.26	0.20	-0.134	0.26	0.25	-0.009
SPIN_OFF	0.13	0.05	-0.233	0.13	0.11	-0.049
2002	0.73	0.89	0.361	0.73	0.74	0.041

Table 4.6: Standardized differences before and after stratification

	non-stratified		stratified	
Dep. Var.: hazard rate	1.	2.	3.	4.
Conscientiousness	0.371	-0.534	0.333	-0.682
	(0.241)	(0.579)	(0.233)	(0.618)
Extraversion	-0.302	0.720	-0.379*	0.489
	(0.208)	(0.444)	(0.208)	(0.458)
Agreableness	-0.501**	-0.508**	-0.428*	-0.444*
	(0.237)	(0.234)	(0.227)	(0.227)
Openness	0.328	-0.850*	0.301	-0.746
	(0.245)	(0.515)	(0.239)	(0.514)
Neuroticism	-0.164	-0.171	-0.185	-0.192
	(0.295)	(0.300)	(0.288)	(0.294)
INNO	-0.402	-4.721**	-0.717**	-5.509**
	(0.305)	(2.307)	(0.351)	(2.436)
IND_PRO_GRO	-1.504**	-1.471**	-1.652**	-1.679**
	(0.737)	(0.745)	(0.696)	(0.698)
Conscientiousness*				
INNO		1.045*		1.168*
		(0.628)		(0.666)
Extraversion*INNO		-1.229**		-1.040**
		(0.498)		(0.505)
Openness*INNO		1.417**		1.259**
		(0.570)		(0.563)
YEARS_SELFEMP	0.101***	0.0996***	0.0886***	0.0879***
	(0.0208)	(0.0209)	(0.0212)	(0.0214)
SIZE_TURN	-0.677**	-0.669**	-0.604**	-0.593**
	(0.278)	(0.283)	(0.280)	(0.284)
TEAM	0.754**	0.732**	0.773***	0.758**
	(0.297)	(0.303)	(0.297)	(0.306)
NACE2	0.660**	0.638**	0.448	0.454
	(0.279)	(0.275)	(0.284)	(0.285)
N	416	416	416	416
Eventd	72	72	72	72
AIC	805.1	801.6	647.0	644.7
BIC	872.2	887.0	714.2	730.1

'*p<0.1;**p<0.05;***p<0.01

Table 4.7: Models 1-4.

4.8 Discussion

In this paper we investigate external and internal factors which lead entrepreneurs to fail. In more detail, we test whether external cost and revenue shocks or innovation is related to entrepreneurial failure. In addition, the moderating effect of personality on the relationship between innovation and entrepreneurial failure is probed.

A rarely established finding is the negative (causal) relationship between innovation and failure. And, as expected, cost and revenue shocks are related with entrepreneurial failure. We find that the effect of innovation on entrepreneurial failure is stronger for entrepreneurs higher in extraversion. Inversely, the effect of innovation on failure is weaker for entrepreneurs higher in openness. An interesting though unexpected result concerns the positive interaction effect between innovation

and conscientiousness on entrepreneurial failure. In other words, conscientiousness weakens the negative effect of innovation on entrepreneurial failure.

A not very surprising finding concerns the effect of external cost and revenue shocks on the propensity of entrepreneurs to fail. One explanation for this finding may be the fact that entrepreneurs struggle in adjusting their firms to the new circumstances regarding their fixed cost structure. Moreover, entrepreneurs may try to encounter an external cost or revenue shock by using a debt financed growth strategy, which is shown to increase the likelihood to fail (see Moulton et al., 1996). This study provides evidence that external factors markedly contribute to entrepreneurial failure.

The negative relationship between innovation and failure was predicted by our hypothesis. Accordingly, advantages of innovations, like creating monopolies, first mover advantages and low visibility outweigh liabilities of newness and the struggles of innovation implementation. The present work provides evidence that innovation contributes to entrepreneurial firm performance (Rosenbusch et al., 2011). As studies on innovation and performance that acknowledge self selection bias are scarce, our findings add insights regarding the causal effect of innovation on small firm performance in innovative environments.

Zhao et al. (2010) find that entrepreneurial performance is linked strongest with openness. Though, some studies show a negative effect of openness on entrepreneurial survival (Ciavarella et al., 2004) or no effect (Baron and Markman, 2005). The result that openness weakens the negative effect of innovation on failure may elucidate this contradiction. Interestingly, openness is suggested to enhance entrepreneurial performance in innovative environments (Zhao et al., 2010; de Jong et al, 2011). Nevertheless, this suggestion maybe rather refers to the generation of innovative products or processes (Bledow et al., 2009). Correspondingly, given that entrepreneurs innovate, the preference for variety of open entrepreneurs is “too much of a good” and lead to liabilities of newness which are not sustainable at the end (Ciavarella et al., 2004). Although, we find no significant relationship between innovation and openness in our sample, more open entrepreneurs might innovate comparably more radically (Fehr, 2009). However, we do not control for the radicalness of innovative activities in this study.

The negative relationship between innovation and entrepreneurial failure is stronger for extraverted entrepreneurs. Therefore, even if extraversion is only weakly

related to entrepreneurial performance (Zhao et al., 2010) and entrepreneurial survival (Ciavarella et al., 2004, Baron and Markman, 2005), it moderates the effect of innovativeness on failure. The moderating effect of extraversion on the innovation failure relationship underlines the importance of networking and establishment of financial sources in order to decrease an innovative firms' liability of newness. Likewise, this result corresponds with the suggestion that personal initiative is a crucial ingredient when it comes to the successful implementation of innovations and failure avoidance.

In contrast to our hypothesis, we find that conscientiousness weakens the negative effect of innovation on entrepreneurial failure. The literature broadly attributes a positive relationship between conscientiousness and job performance (Barrick and Mount, 1991; Salgado, 1997; Hurtz and Donovan, 2000; Barrick et al., 2001). However, those unidirectional results have to be considered with caution. Some facets of conscientiousness definitely have negative effects on job performance (Tett, 1998; Tett et al., 1999). Particularly, innovative entrepreneurs have to solve creative problems (Amabile, 1997a). Even in successfully implementing innovations, entrepreneurs need to think differently (Im and Workman, 2004; Zhou, 2008). The facet of conscientiousness dependability, which is a tendency to obey social rules and norms, is obstructive for job performance in creative jobs and hinders “thinking outside the box” (Tett, 1998, p. 26). Moreover, orderliness, deliberateness and methodological are other facets of conscientiousness which counteract adaptiveness (LePine et al., 2000). Nevertheless, successful innovation hinges on adaptability to the external environment (Hurley and Hult, 1998) and entrepreneurs need to adjust to unexpected customer reactions when it comes to innovation implementation (see Im and Workman, 2004). In other words, entrepreneurs need to adapt their firms internally and externally to overcome a high liability of newness, otherwise they may fail (Choi and Shepherd, 2005). Therefore, our work contributes to evidence that conscientiousness is not always a predictor of job performance, especially if the job outcome is uncertain or a creative artifact (Tett, 1998; Feist, 1998; George and Zhou, 2001; Tett and Burnett, 2003)

There are limitations regarding our study. First of all, our measure of innovativeness is based on self-reports. Despite there exists no objective measure for innovation, future research ought to draw on external expert judgements to validate self-assessments of entrepreneurs. We furthermore used no scale for the degree of

innovativeness, which may lead to incorrect conclusions. For instance, more radical innovations may be more risky and thus lead to a higher likelihood of failure compared to less radical innovations. Future research ought to consider both concerns.

Secondly, our measure of cost and revenue shocks is relatively broad at the nace-2-digit level. Industries and markets are quite specific, even though they are technologically related and thus a more fine grained view on cost and revenue shocks might be helpful. Likewise, the question of how cost and revenue shocks lead to failure (i.e. a certain fix cost structure, wrong strategy to deal with the external shocks etc.) could not be addressed by this study.

Third, our measure of personality was compiled ex post. Thus, instead of only affecting the result of entrepreneurial failure, the Big Five traits might marginally be influenced by this experience (Vaidya et al., 2002). Likewise, meta-analytical evidence shows that especially in young adulthood (20-40 years) moderate mean level changes in personality occur (Roberts et. al., 2006). Nonetheless, at the time of launching their firm the mean age of the failed entrepreneurs in our sample was over 40 (39 for the not failed), which exceeds young adulthood and therefore personality mean level changes are a negligible problem.

Finally, our economic success measure is in part based on self-reports. More precise data on economic firm success might improve the accuracy of our results. A replication of this study with more precise financial firm data at a panel basis can solve this problem. The third difficulty concerns our indicator of innovativeness, which is based on self-reports too. Likewise, a more precise approach to gauge innovativeness, like measuring the radicalness of innovation might be illuminating.

Despite these limitations, our findings offer several contributions. The research design allows for causal interpretation of our results, given the observed confounders, as almost all sample selection bias concerning innovative entrepreneurship is removed (see Rosenbaum and Rubin, 1983). Thus, setting up a new venture based on an innovative product or process is a promising strategic choice. We also provide robust evidence that the effect of innovation on entrepreneurial failure is moderated by personality. At present, relatively little evidence exists on this relationship. In line with meta-analytical evidence (Rauch and Frese, 2007a; Zhao et al., 2010), this outcome implies that the personality of entrepreneurs is linked indirectly to the performance of their (innovative) firms.

Furthermore, our study considers apparently “successful” exits and thus grasps failed entrepreneurs.

Practical implications of our results mainly refer to strategic considerations and consulting opportunities. From a strategic point of view, founding a business based on an innovation is more promising than an imitative start-up in innovative industries. This suggestion may also inform decisions of financiers, suppliers, customers, investors or employees of new ventures in innovative environments. When it comes to start-up consulting, advisors can also make founders aware of the fact that innovative firms are less likely to fail in innovative industries. And, accordingly, motivate their clients to base their business ideas on an innovation.

The significant effect of external cost and revenue shocks points to entry strategies which acknowledge the volatility of industries in order to avoid entrepreneurial failure. However, industry uncertainties are hard to predict, especially if technological discontinuities play a role (see Tushman and Anderson, 1986).

Viewing on implications of the moderating effect of personality on the innovation failure relationship, cognitive learning and business services can help to decrease the hazard of entrepreneurial failure. Social skills are trainable (Baron and Tang, 2009). Hence, less extraverted entrepreneurs leading innovative firms may gain social skills through training in order to outbalance their disadvantages in establishing social networks with stakeholders. In turn, they may decrease their innovative firms' liability of newness. Akin to this proposition, innovative entrepreneurs may draw back on external consultants, business angels, venture capitalists or other partners like established firms to decrease their firms’ liability of newness (Aldrich and Auster, 1986; Shepherd et al., 2000).

On the other hand, open entrepreneurs may draw back on experienced business consultants, who are able to figure out whether a business idea is realistic or not. Another implication for quite open entrepreneurs is that they back up their risky business ideas with enough financial resources (Ciavarella et al., 2004). Yet these suggestions should be taken cautiously, as the economy as a whole needs visionary entrepreneurship, although it may lead to failure from time to time.

Conscientious entrepreneurs may struggle to creatively adapting obstacles when it comes to implementing innovations, like reorganizing the firm or adjusting uncertain customer requirements. Again, external help, like consulting or the involvement of customers in innovation implementation may provide a remedy

against failure. In addition, creativity enhancing techniques like an open communication or an offensive attitude towards the future may help to assure creativity for implementing innovations (Amabile et al., 1996; Amabile, 1997b). Concerning the moderating effect of personality in general, regulatory effort through a proactive working attitude may enable entrepreneurs to implement innovations successfully even if dispositions work against that goal (Bledow et al., 2009).

Implications for future research concern the investigation of specific sub-dimensions of openness, extraversion and conscientiousness that have a moderating effect on the innovation entrepreneurial failure relationship. As Rauch and Frese (2007b) point out, narrow traits might explain more variance. Also, investigating other moderators that affect the personality performance relationship in entrepreneurship research are helpful, like environmental dynamism or competition.

In conclusion, we add insights to the literature of innovation and entrepreneurial failure. We point out that personality has at least an indirect impact on this entrepreneurial outcome.

5 Chapter: For whom the bell tolls – personality and various motives of entrepreneurial exit[19]

5.1 Introduction

Many studies of entrepreneurship address the characteristics of entrepreneurs and their effect on entrepreneurial success or failure. A popular proxy for failure is entrepreneurial exit (Brüderl et al., 1992). In most of the studies of exits, no distinction is made between exit reasons (Davidsson, 2008; Watson, 2010), failure and successful closure (see Headd, 2003). Moreover, research into various exit reasons recognizes the economic factors that determine exit decisions (see Wennberg et al., 2010). However, as Gimeno et al. (1997) claims, entrepreneurs rely at least partially on psychic benefits when it comes to exit decisions, and even non-economic forces may lead to exits. These non economic factors, like relationships and emotional health, are useful to investigate (Cardon et al., 2005; DeTienne and Cardon, 2010), because entrepreneurial exit has a strong impact on the entrepreneur, the firm, industry dynamics and the whole economy through reallocation of resources (DeTienne, 2010). In general, entrepreneurial exit is widely understudied (DeTienne and Cardon, 2010).

Entrepreneurs with specific qualities design their firms and their surroundings, which may impact on their propensity for certain outcomes (Sarasvathy, 2004). But what are these factors? One very promising avenue of research in explaining entrepreneurial exit is an entrepreneur's personality. In order to investigate this I will use the 'Big Five' personality traits (Digman, 1990; Barrick and Mount, 1991; Barrick et al., 2003). To the best of my knowledge only one study exists that investigates the relationship between the Big Five personality traits and entrepreneurial failure (Cantner et al., 2012), but no study links the Big Five to various exit motives.

Therefore in this paper I raise the question: "Does the founder's personality relate differently to various exit reasons in highly innovative environments?" The dataset that I will utilize in order to answer this question consists of 425 entrepreneurs of highly innovative start-ups located in the German Federal State of

[19] An earlier paper version of this chapter was granted with the „Bent Dalum PhD Award" in the context of the 2012 DRUID Academy Conference in Cambridge, United Kingdom, for the most promising and innovative research project.

Thuringia. With the help of the data, it is possible to distinguish 4 different motives for quitting entrepreneurial activities. I employ multivariate Cox regressions (Wei et al., 1989) to trace possible links between the entrepreneur's Big Five personality traits of extraversion, agreeableness and neuroticism and 4 different motives to quit, which are (1) overinvestment of financial resources, (2) friction in the founder team, (3) job dissatisfaction, and (4) other reasons.

As the relationship between the above exit motives and their determinants have not been effectively investigated in the past, the present study sheds some light on several unanswered questions in entrepreneurship research. Firstly, entrepreneurial overinvestment in financial resources has been investigated theoretically (Shepherd et al., 2009) and in an experiment (Holland and Shepherd, in press), but not with the help of field data. The drivers of overinvestment of financial resources are important, as overinvestment represents a misallocation of financial resources. Secondly, job turnover because of job dissatisfaction is mainly investigated for non-entrepreneurs and is thus not well understood in the field of entrepreneurship. As job dissatisfaction is inimical to health (Faragher et al., 2005) and general well-being (Warr, 1999), it is helpful to shed some light on the reasons for entrepreneurial exists. Finally, research into the exit decisions of founder team members and entrepreneurial exit from team ventures has stressed the importance of demographic and human capital variables (Ucbasaran et al., 2003), but not the personalities of the lead founders. As the exit of the lead founder of a founder team may have an important impact on an entrepreneurial firm, an entrepreneurial exit caused by friction in the founder team is an important issue in entrepreneurship research.

The paper is organized as follows. In the next section I discuss the threshold model of performance of Gimeno et al. (1997). I will demonstrate that not only economic factors play a role in exit decisions but also that differing conditions that cause economic and psychological imbalances may lead to such exits. The potential driver of these differing constellations is the personality, as it is this that shapes the occupational choice functions of entrepreneurs. The personality system theory is introduced in Section 5.3. Section 5.4 deals with theoretical and empirical findings about the relationship between the personality and the above mentioned motives to quit. Also, the respective hypotheses are outlined. The analytical framework and the dataset for testing my hypotheses are introduced in Section 5.5. Section 5.6 treats the

results and a discussion on them takes place in Section 5.7.

5.2 Are all exits the same?

In general, I will follow the definition of entrepreneurial exit given by DeTienne (2010, p. 204) as "…the process by which the founders of privately held firms leave the firm they helped to create; thereby removing themselves…from the primary ownership and decision-making structure of the firm." Entrepreneurial exit decisions are mainly explained by utility maximization and entrepreneurial exit as a career choice. The model of Gimeno et al. (1997) refers to exit decision of firms through their decision makers. In line with DeTienne and Cardon (2010), I suppose that this model may explain entrepreneurial exit decisions as well. Akin to Gimeno et al. (1997), there are two expected utility functions:

$$\begin{aligned} U_A &= EI_A(X_1) + PI_A(X_2) \\ U_E &= EI_E(X_3) + PI_E(X_4). \end{aligned} \tag{1}$$

U_A represents the expected utility of alternative employment, like launching another firm or to be employed, while U_E renders the expected utility of remaining in an entrepreneurial firm. EI_A or EI_E represent the expected economic incomes in a different job or in one's own firm respectively. PI_A and PI_E represent the entrepreneurs' psychic income, either in an alternative employment or through remaining in one's own firm. The vectors X_1, X_2, X_3 and X_4 are individual factors affecting respective incomes, such as personality traits or human capital. If switching costs is neglected, a rational entrepreneur ought to exit his own firm if

$$U_E < U_A. \tag{2}$$

Thus, inserting (1) in (2) and reorganizing to EI_E on the left hand side leads to

$$\begin{cases} entrepreneurial\ exit\ if & EI_E + PI_E < EI_A + PI_A \\ stay\ in\ venture\ if & EI_E + PI_E \geq EI_A + PI_A \end{cases}. \tag{3}$$

Equation (3) shows that entrepreneurial exits depend not only on EI_E, but also on EI_A, PI_A and PI_E (Gimeno et al., 1997). Within this framework, a definition of failure that links exits solely to the economic income from business ventures is too narrow. Instead, "…failure is the termination of an initiative that has fallen short of its goals" (McGrath, 1999, p. 14). Hence, beyond economic incomes EI_E and EI_A and psychological incomes PI_E and PI_A determine entrepreneurial exit decisions, so that investigating exit reasons from a mere financial perspective is inadequate. In other words, different constellations of EI_A, EI_E, PI_A and PI_E lead to exits and, thus, various exit reasons ought to be investigated in order to draw meaningful conclusions.

For simplicity's sake, I will assume that EI_A and PI_A are fixed expected values which only will be disclosed after exits. This statement makes sense in the light of Jovanovics' (1982) claim that entrepreneurs learn ex-post about their entrepreneurial abilities. It is also in line with Jovanovics' (1979) job matching theory, according to which imperfect information regarding new jobs is prevalent. Thus, the qualities of a new employment are only disclosed after an employment switch. I control for those opportunity costs during exit in the process of making estimations. I examine the relationships between the entrepreneurs' personalities and various exit reasons, which are not only constituted by economic or financial drivers.

What are the other reasons that cause entrepreneurial goals to fall short? Ronstadt (1986) suggests that, from the perspective of an entrepreneur, there are three main reasons for an entrepreneurial exit, which may be financial, personal or firm-related. However, even this classification might be too general in order to establish a proper explanation for an exit. Thus, I investigate specific examples of exits that may be attributed to these three main reasons.

5.2.1 Exit due to overinvestment of own financial resources

With regard to financial reasons, van Witteloostuijn (1998; see also De Tienne et al., 2008; Holland and Shepherd, in press) claims that firms often remain in operation even when their performance is poor. One reason for this is the escalation of commitment behavior (Staw, 1981). This behavior suggests the avoidance of exit

from an adverse course of action, especially if the decision unit is responsible for the adverse development. Escalation of commitment behaviour is related to the personality of individuals (Wong et al., 2006). Correspondingly, entrepreneurs who are prone to escalation commitment behavior may stick with their weak performing firms until they realize distress sale or distress liquidation (Wennberg et al., 2010). As a consequence, one financial reason for an entrepreneurial exit is the overinvestment of one's own financial resources. In this respect, entrepreneurs who not engaged in a "flight from losses" according to van Witteloostuijn's (1998, p. 503) classification may have particular personality characteristics (Kuhnen et al., 2011).

In the case of financial overinvestment, for certain entrepreneurs the psychic income PI_E in (3) obtained from their venture might be higher than for others, given the same economic performance (Shepherd et al., 2009), which is due to their personal (Holland and Shepherd, in press) or risk characteristics (Forlani and Mullins, 2000). Studies of entrepreneurial persistence despite poor venture performance stress the importance of environmental munificence, investment in personal efforts, alternative options, previous organizational success, perceived collective efficacy, extrinsic motivation (De Tienne et al., 2008) and personal values (Holland and Shepherd, in press).

Nevertheless, relatively little evidence exists regarding the relationship between personality and exit because of financial over-investment in an underperforming firm. I test whether personality is related to exit due to over-investment of financial resources.

5.2.2 Exit due to job dissatisfaction

Personal problems drive entrepreneurial exits. In this context, personal problems may be related to family problems (Justo and DeTienne, 2008; Egeln et al., 2010) and stress because of the responsibility for other people or conflicts with other stakeholders. If expectations and realities in managing a firm diverge, the entrepreneur may experience personal dissatisfaction, which may result in exit (Cooper and Artz, 1995; Cardon et al., 2005). Nevertheless, whether entrepreneurs have higher or lower job satisfaction in certain situations of managing a firm may depend on their personality profiles (Bradley and Roberts, 2004). With respect to exits, entrepreneurial job dissatisfaction causes low psychic income PI_E in (3),

which perhaps is simultaneously affected by low economic venture performance EI_E. Therefore, I test how personality relates to entrepreneurial exit caused by job dissatisfaction.

5.2.3 Exit due to friction in the founder team

Besides motives concerning financial and personal issues, problems related to a firm's structure can cause entrepreneurial exit. If the decision making structure of a firm is determined by an entrepreneurial team, conflicts may arise due to disagreements among the founder management team members (see Amason and Sapienza, 1997) concerning strategical or operational questions, which in turn can lead to entrepreneurial exit (Chandler et al., 2005). Founder team conflicts can mainly be attributed to team heterogeneity with regard to human capital (Ucbasaran et al., 2003), race, age, prior industrial experience or team size (Hellerstadt et al., 2007). Nevertheless, even team members' personalities can cause founder team conflicts (Bono et al., 2002; Jong et al., 2011). Because conflicts may result from both poor venture performance (Ensley et al., 2002; Jong et al., 2011) or discontentment, exit due to disagreements in the founder team are fostered by low psychic income PI_E and/or poor economic performance, represented by EI_E in equation (3), due to poor coordination among the founder team members. I investigate whether personality relates to exit because of disagreement in the founder team, given that a founder team exists.

The next section introduces the Big Five personality traits. I employ this measure in order to test whether personality affects various exit reasons differently.

5.3 The Big Five personality traits

A widely accepted measure of personality is known as the Big Five taxonomy (Digman, 1990; Goldberg, 1990; Barrick and Mount, 1991; Barrick et al., 2003). The Big Five are considered to be independent from an individual's self-concept (McCrae and Costa, 1987), valid across different cultures (McCrae and Costa, 1997; John and Srivastava, 1999), largely time invariant (Costa and McCrae, 1992; Roberts and DelVecchio, 2000; Hampson and Goldberg, 2006) and partly genetically determined (Jang et al., 1997). Moreover, the Big Five relate to occupational behaviour

(Robertson and Callinan, 1996) and job turnover decisions (Zimmerman, 2008).

The Big Five are part of a dynamic personality system (McCrae and Costa, 1996; 1999). Particularly, the Big Five result from basic tendencies which develop throughout childhood, mature in adulthood and shape an individual. The link between personality and biographical outcomes is given by characteristic adaptations. Characteristic adaptations are dynamic motivational, social-cognitive and developmental manifestations, like aims, intentions, personal aspirations, concepts, abilities, relationships or even self-concepts resulting from perpetual personality-environment interactions (McAdams and Pals, 2006). I apply the Big Five to explain the differences in the relationships between personality and various exit reasons, because they form characteristic adaptations which affect practical behavior (McAdams and Pals, 2006).

The Big Five taxonomy consists of conscientiousness, extraversion, agreeableness, openness, and neuroticism. Extraversion is defined as "…an energetic approach toward the social and material world and includes traits such as sociability, activity, assertiveness, and positive emotionality" (John and Srivastava, 1999, p. 121). Likewise, extraverted people favor the company of other people and possess surgency. However, this does not mean that extraverts are necessarily liked by other people (McCrae and Costa, 1987). Next, neuroticism "…contrasts emotional stability and even-temperedness with negative emotionality, such as feeling anxious, nervous, sad, and tense" (John and Srivastava, 1999, p. 121). One main feature of neuroticism is the propensity to act impulsively and exhibit negative affect (McCrae and Costa, 1987). Agreeableness is said to be "…a prosocial and communal orientation towards others with antagonism and includes traits such as altruism, tender-mindedness, trust, and modesty" (John and Srivastava, 1999, p. 121). In contrast, less agreeable people try to oppose and master others (McCrae and Costa, 1987). Conscientiousness is attributed to a "…socially prescribed impulse control that facilitates task- and goal-directed behaviour, such as thinking before acting, delaying gratification, following norms and rules, and planning, organizing, and prioritizing tasks (John and Srivastava, 1999, p. 121). Conscientiousness induces task- and goal-orientations (Gellately, 1996). Finally, openness covers "…the breadth, depth, originality, and complexity of an individual's mental and experiential life" (John and Srivastava, 1999, p. 121). Accordingly, open individuals have broad interests and are dreamy and artistic (McCrae and Costa, 1987).

5.4 Personality and various exit reasons

5.4.1 Personality and exit due to overinvestment of one's own financial resources

Entrepreneurial exit can occur as a result of financial overinvestment if entrepreneurs take too much risk (Forlani and Mullins, 2000) or if they do not set themselves a limit of affordable loss (Dew et al., 2009). Likewise, risk aversion increases the likelihood of exit compared to continuing a poor performing business with further investments (Wennberg et al., 2010). This phenomenon refers to escalation commitment behaviour (van Witteloostuijn 1998).

The Big Five trait of neuroticism decreases the risk-taking propensity of individuals (Nicholson et al., 2005; Daly et al., 2010) and increases precautionary avoidance (Lommen et al., 2010). Additionally, neurotic people often react to adverse outcomes with negative emotions. In turn, negative emotions inhibit the escalation of commitment behaviour (Wong et al., 2006). As a consequence, instead of investing more financial resources, highly neurotic entrepreneurs high are more likely to exit if their firm performs poorly. Moreover, neuroticism relates to lower ex-ante investments when uncertainties occur (Kuhnen et al., 2011). Therefore, I would suggest that neuroticism negatively relates to exits because of financial overinvestment, compared to other reasons for exit. In that case the following hypothesis applies:

Hypothesis 1: Compared to other exit reasons, the likelihood of exit due to overinvestment of one's own financial resources is decreased by neuroticism.

5.4.2 Personality and exit due to job dissatisfaction

Neuroticism decreases the ability of people to cope with stress (Lahey, 2009). Stress relates to job dissatisfaction (Sullivan and Bhagat, 1992). Accordingly, neuroticism relates to job dissatisfaction (Tokar and Subich, 1997; Judge et al., 2002), which in turn results in job turnover (Zimmerman, 2008). Likewise, neuroticism negatively correlates with well-being (McCrae and Costa, 1991; Weiss et al., 2007; Steel et al., 2008) and promotes negative affect based on negative mood inductions (Larsen and Ketelaar, 1991). Neurotic entrepreneurs are thus more likely to leave their firms because of job dissatisfaction, which is triggered by stress in their

job. In a similar vein, neurotic entrepreneurs tend to be more moody in cases of breakdown, which leads to job dissatisfaction. Negative emotions, which are strongly correlated with neuroticism (Larsen and Ketelaar, 1991), may then even accelerate the decision to exit. Thus, neuroticism possibly increases the risk of exit due to job dissatisfaction, compared to other exit reasons.

Extraversion relates to well-being (McCrae and Costa, 1991; Weiss et al., 2007; Steel et al., 2008) and job satisfaction (Tokar and Subich, 1997; Judge et al., 2002). Nevertheless, extraversion is also a strong predictor of positive emotions (Larsen and Ketelaar, 1991; Mount et al., 1998; Srivastava et al., 2008). Thus, positive emotionality is identified to be a strong moderator of the relationship between job dissatisfaction and job turnover (Judge, 1992). Hence, if extraverted entrepreneurs sense job dissatisfaction, they are more likely to leave their firm voluntarily due to their tendencies towards positive emotionality. In other words, in the case of job dissatisfaction, their expected psychic income from alternative employment is likely to be lower. Hence, compared to other exit reasons, both extraversion and neuroticism increase the likelihood of exit due to job dissatisfaction.

In line with the argument above, the following hypothesis is developed:

Hypothesis 2: Compared to other exit reasons, the likelihood of exit due to job dissatisfaction increases if entrepreneurs exhibit more (a) neuroticism and (b) extraversion.

5.4.3 Personality and exit due to friction in the founder team

Mount et al. (1998) claim that agreeableness and neuroticism are strong predictors of cooperation and teamwork performance. In particular, agreeableness decreases the tendency to have prejudices (see Ekehammar and Akrami, 2007) and reduces interpersonal counterproductive work behavior, like swearing at co-workers (Mount et al., 2006). Agreeableness relates to efficient team work (see Mount et al., 1998; Barrick et al., 2001) and a team member's contentment with his team (Peeters et al., 2006). Conflicts in the founder team hence are less likely if team members are agreeable, as they will have less prejudices and do not revealing interpersonal counterproductive work behavior. Furthermore, agreeable entrepreneurs may obtain higher contentment from working in a founder team. Agreeableness therefore

decreases the likelihood of entrepreneurial exit due to friction in the founder team, compared with other exit reasons.

Neuroticism is related to mood swings, susceptibility to stress and inefficient coping behaviour. Also, it decreases emotional intelligence (Zeidner et al., 2004), which is the capability to recognize ones' own and other people's feelings in order to process this information as behavioral guidance (Salovey and Mayer, 1990). In addition, neuroticism decreases efficient team work (see Mount et al., 1998; Barrick et al., 2001) and team members' contentment with their fellow team members (Peeters et al., 2006). Neurotic lead founders are more likely to cause friction in the founder team, as they are likely to be moody, less stress resistant and low in emotional intelligence (de Jong et al., 2011). As mentioned above, neuroticism relates to negative emotions in the case of negative mood inductions (Larsen and Ketelaar, 1991). Owing to interpersonal problems and emotional actions, the likelihood to exit due to friction in the founder team is suggested to be increased for neurotic entrepreneurs, in comparison with other exit reasons.

Thus, agreeableness relates negatively, while neuroticism is positively associated with exit because of friction in the founder team, compared to other exit reasons. I will therefore suggest the following hypothesis:

Hypothesis 3: Compared to other exit reasons, the likelihood of exit due to friction in the founder team increases if entrepreneurs are (a) lower in agreeableness, and (b) higher in neuroticism.

5.5 Data and empirical methods

5.5.1 Sample and data selection

In order to test Hypotheses 1-3, I utilize data from the Thuringian Founder Survey. This is an interdisciplinary project regarding the success and failure of team and soloentrepreneurs in the German Federal State of Thuringia. The Thuringian Founder Survey focuses on entrepreneurs operating in innovative industries which use what the Centre for European Research (ZEW) classifies as "advanced technology" and "technology-oriented services" (Grupp and Legler, 2000). The population of the survey consists of 4,215 founders who registered their firms with a commercial registry in Thuringia between 1994 and 2006. 639 face-to-face

interviews were accomplished between January and August 2008. All in all, 219 cases were dropped because of missing observations, lack of interview quality, or not being original start-ups. The remaining sample size comprised 425 observations, from which 98 (co-) founders ceased their entrepreneurial activity until 2008. If there was a founding team, the intention was to interview the main founder.

From these 98 discontinuances, four specific reasons for discontinuance were identified[20], namely exit because of: (1) overinvestment of own financial resources (23 cases), (2) job dissatisfaction (13 cases), (3) friction in the founder team (29 cases), and (4) other reasons (75 cases). Descriptive statistics concerning simultaneous occurring exist cases may be seen in Table 5.1.

	1.	2.	3.	4.
1. Overinvestment of own financial resources	23			
2. Job dissatisfaction	5	13		
3. Friction in the founder team	9	8	29	
4. Other reasons	17	11	18	75

Table 5.1: Overlapping exit reasons

5.5.2 Dependent variable: hazard rate

I employed multivariate (stratified) hazard rate regressions (Wei et al., 1989; Lin et al., 1992) to test for the differing effects of the entrepreneur's personality on the three reasons given above for exits, namely (1) overinvestment of personal resources, (2) job dissatisfaction, (3) problems with other founder team members in comparison to (4) other exit reasons. The hazard rate equalled the probability for instantaneous entrepreneurial exit, given that the entrepreneur had been active until time *t*. The advantages of hazard rate models include the ability to recognize the correct censoring and nonnegative values of spell-data, which is not possible with logit or linear regression. The hazard rate of observation *i* and type of failure *k* can henceforth be expressed as:

$$h(t) = \lambda_{0k}(t)\exp(\beta_k' x_{ik}). \quad (4)$$

The failure-type specific baseline hazard function $\lambda_{0k}(t)$ and the vector of

[20] Multiple answers were possible in the questionnaire. The items are introduced in section 5.3.

coefficients β_k may vary across types of failures. I exploit this feature in order to investigate differing relationships between the Big Five traits extraversion, agreeableness and neuroticism and various exit reasons. As the "…dependence structure for related failure times is unspecified…" (Lin, 1994, p. 2234), this framework *permits* dependence among failure times without biased estimators. In other words, the marginal distributions of the related failure times are estimated. I employ robust stratum-specific standard errors, following Wei et al. (1989).

In line with Lunn and McNeill (1995), I split up the sample 4 times to assure 4 different exit hazards for each entrepreneur. Moreover, from 425 entrepreneurs in my sample, only those 289 entrepreneurs who participated in team foundations are considered under the risk of exit due to friction in the founder team. After this procedure, there are 1564 observations and 140 exits. In order to test the differing relationships between various exit reasons and extraversion, agreeableness and neuroticism, I included reason specific interaction terms (see Lunn and McNeill, 1995), which allow testing whether or not a common effect exists. The main effects then account for the relationship between personality and other reasons for exit. However, a straightforward interpretation of the coefficients is difficult in this case, as the relationship between the respective baseline hazard rates is not estimated (Lunn and McNeill, 1995). The controls in my models serve as average effects across all exit reasons (see Lin, 1994). All the models are estimated with Stata 11.

5.5.3 Explanatory variables: The Big Five traits and reasons for failure

The Big Five traits of extraversion, agreeableness, neuroticism, conscientiousness and openness of the investigated entrepreneurs were measured in terms of 45 standardized items, and, in particular, using 9 German bipolar adjectives on a six-point Likert-scale (0-5) (Ostendorf, 1990). The level of the Big Five traits was derived from the mean of each of the values on the corresponding bipolar scales. The traits of conscientiousness and openness served as controls, as the theory does not suggest that those might have an effect on exit reasons.

With respect to the various exit motives, (1) exit due to overinvestment of one's own financial resources (EX_FIN) was measured by "I lost too much money", (2) exit due to job dissatisfaction (EX_DISS) by "The work wasn't fun anymore" and

(3) exit due to friction in the founder team (EX_TEAM) by "I was not able to cope with my partners anymore".

5.5.4 Control Variables

Entrepreneurial exit is not only affected by the personality of a founder manager. Also socioeconomic variables and firm features may have an impact on this decision. Beyond the personality of the founder manager, especially in highly innovative environments, human capital may explain exit (see Bates, 1990; Gimeno et al., 1997; DeTienne and Cardon, 2010). Likewise, industry related experience is linked to firm exit and this may also correspond to entrepreneurial exit (Klepper, 2002; Buenstorf and Klepper, 2010b). Moreover, firm size has an effect on firm exit (Audretsch and Mahmood, 1993; 1994; 1995) and may also drive entrepreneurial exit. Bearing in mind that the firm environment (Baum et al., 2001) and industry structure (Chrisman et al., 1998) may have an effect on firm exit, these factors may perhaps also affect entrepreneurial exit. Also, the issue of whether the founder is involved in an entrepreneurial team ought to have an impact on entrepreneurial exits (Ucbasaran et al., 2003).

In conclusion, I control for the age of entrepreneurs at the time of starting the corresponding business (AGE), number of years in self-employment (SELFEMPL), industry related experience (IND_EXP; 1=Yes, 0=No), gender (GEND; 1=Female, 0=Male), the number of other founder team members (NO_TEAM) and the NACE industry classification (1-digit, NACE2, chemical industry, 1=Yes, 0=No; NACE2, electrical engineering, fine mechanics, optics, 1=YES, 0=NO; NACE7, information and communication technology, 1=YES, 0=NO). In order to control for the expected income for the alternative employment, I included a variable indicating the number of other firms in operation while managing the firm (NO_FIRMS).

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.
1. Extraversion	1.00																	
2. Agreeableness	0.05	1.00																
3. Neuroticsim	-0.34***	-0.18***	1.00															
4. Openness	0.27***	0.02	-0.24***	1.00														
5. Conscientiousness	0.19***	0.10**	-0.27***	0.11**	1.00													
6. AGE	0.05	0.14***	-0.02	-0.06	0.14***	1.00												
7. SELFEMPL	0.05	0.05	-0.04	0.04	0.02	0.17***	1.00											
8. IND_EXP	0.05	0.06	0.01	-0.03	0.01	-0.04	0.05	1.00										
9. GEND	0.09*	0.02	0.03	-0.00	0.04	-0.08	-0.08*	0.11**	1.00									
10. NO_FIRMS	0.06	-0.02	0.03	0.05	-0.06	0.17***	0.41***	0.01	-0.09**	1.00								
11. NO_TEAM	0.03	-0.00	-0.00	0.03	-0.03	0.06	-0.00	0.00	0.01	-0.01	1.00							
12. NACE2	0.05	0.06	0.01	-0.12***	0.09*	0.15***	0.03	-0.02	-0.09*	0.12***	-0.08*	1.00						
13. NACE3	-0.07	-0.08*	0.05	0.02	0.03	0.15***	0.04	0.11**	-0.07	-0.01	0.09*	-0.31***	1.00					
14. NACE7	-0.01	0.01	-0.01	0.12***	-0.15***	-0.19***	-0.03	-0.04	0.06	-0.06	0.04	-0.41***	-0.42***	1.00				
15. EX_FIN	-0.01	-0.03	-0.19*	0.06	-0.01	-0.05	0.33***	-0.04	0.10**	-0.11	0.19*	-0.17	0.10	-0.04	1.00			
16. EX_DISS	0.16	-0.29***	0.19*	-0.05	-0.19*	-0.07	0.07	0.06	0.06	0.21**	0.16	0.04	-0.03	0.01	0.14	1.00		
17. EX_TEAM	0.03	-0.14	0.10	0.07	-0.15	0.14	0.20**	-0.17*	-0.00	-0.07	0.26***	0.05	-0.10	0.10	0.10	0.26***	1.00	
18. EX_OTH	-0.02	0.04	-0.02	0.02	0.04	0.19***	0.12***	0.12***	-0.01	-0.03	0.10**	0.05	-0.02	-0.05	-0.03	0.07	-0.26***	1.00

*p<0.1;**p<0.05;***p<0.01

Table 5.2: Correlation coefficients

	mean#	mean*	mean§	mean&	mean)	SD#	SD*	SD§	SD&	SD)	max#	max*	max§	max&	max)	min#	min*	min§	min&	min)
1. Extraversion	3.21	3.16	3.41	3.19	3.17	.63	.695	.474	.602	.619	4.78	4.11	4.11	4.11	4.44	1.44	1.67	2.67	1.67	1.67
2. Agreeableness	3.11	3.01	2.58	2.92	3.14	.557	.78	.621	.589	.611	5	4.44	3.67	4.11	4.44	.889	1.22	1.44	1.44	1.22
3. Neuroticsim	1.36	1.2	1.63	1.46	1.35	.501	.609	.37	.53	.547	3.11	2.56	2.11	2.56	2.56	0	.222	.889	.375	.222
4. Openness	3.17	3.27	3.14	3.27	3.2	.536	.441	.409	.533	.562	4.89	4	3.78	4.38	4.56	1.56	2.33	2.44	2.11	2.11
5. Conscientiousness	3.62	3.71	3.45	3.59	3.69	.601	.615	.661	.548	.62	4.89	4.78	4.56	4.44	4.78	0	2.33	2.44	2.33	2.33
6. AGE	38.9	41.8	41.1	44.9	43.7	9.27	9.72	6.53	8.34	9.79	63	67	51	67	67	18	25	29	29	25
7. SELFEMPL	2.15	6.22	4.31	4.87	3.55	4.14	7.05	5.12	6.67	4.87	34	26	13	26	26	0	0	0	0	0
8. IND_EXP	.84	.78	.69	.87	.72	.366	.422	.48	.346	.452	1	1	1	1	1	0	0	0	0	0
9. GEND	.0734	.0174	.154	.067	0.067	.261	.388	.376	.254	.251	1	1	1	1	1	0	0	0	0	0
10. NO_FIRMS	.352	.174	.615	.233	.293	.723	.388	1.04	.504	.588	5	1	3	2	3	0	0	0	0	0
11. NO_TEAM	2.21	3.3	3.46	3.4	2.64	1.26	3.07	3.91	2.65	1.35	8	16	16	16	7	1	1	1	1	1
12. NACE2	.22	.13	.308	.3	.28	.415	.344	.48	.466	.452	1	1	1	1	1	0	0	0	0	0
13. NACE3	.235	.348	.231	.2	.227	.425	.487	.439	.407	.421	1	1	1	1	1	0	0	0	0	0
14. NACE7	.373	.261	.308	.367	.307	.484	.449	.48	.49	.464	1	1	1	1	1	0	0	0	0	0

#indicates censored observations
*indicates exit because of overinvesment of own financial resources
§indicates exit because of dissatisfaction with the job
&indicates exit because if friction in the founder team
)indicates exit because of other reasons

Table 5.3: Summary statistics

	stratified				non-stratified
Dep. Var: hazard rate	1.	2.	3.	4.	5.
EX_FIN					-0.524
					(0.432)
EX_DISS					-7.733***
					(1.859)
EX_TEAM					0.915
					(0.998)
Extraversion	-0.0893	-0.247	-0.193	-0.355	-0.356
	(0.225)	(0.232)	(0.217)	(0.226)	(0.226)
Agreeableness	-0.273	-0.536**	-0.160	-0.414	-0.426
	(0.242)	(0.250)	(0.257)	(0.268)	(0.266)
Neuroticism	0.0263	0.0746	-0.0634	-0.00746	0.00527
	(0.293)	(0.273)	(0.275)	(0.271)	(0.268)
Openness	0.289	0.431**	0.302	0.452**	0.450**
	(0.203)	(0.218)	(0.203)	(0.220)	(0.221)
Conscientiousness	0.172	0.158	0.192	0.169	0.176
	(0.213)	(0.284)	(0.217)	(0.285)	(0.289)
AGE		0.0433***		0.0440***	0.0443***
		(0.0113)		(0.0114)	(0.0115)
SELFEMPL		0.114***		0.114***	0.115***
		(0.0231)		(0.0231)	(0.0234)
IND_EXP		0.348		-0.360	-0.347
		(0.283)		(0.283)	(0.286)
GEND		0.428		0.430	0.437
		(0.512)		(0.504)	(0.513)
NO_FIRMS		-0.535*		-0.548**	-0.551**
		(0.274)		(0.277)	(0.278)
NO_TEAM		0.272***		0.268***	0.272***
		(0.0434)		(0.0444)	(0.0459)
NACE2		-0.109		-0.124	-0.124
		(0.361)		(0.359)	(0.363)
NACE3		-0.742*		-0.759*	-0.768*
		(0.403)		(0.405)	(0.411)
NACE7		-0.517		-0.524	-0.522
		(0.373)		(0.373)	(0.376)
EX_FIN*Neuroticism			-0.614	-0.519	-0.524
			(0.436)	(0.352)	(0.357)
EX_DISS*Extraversion			1.086***	1.114***	1.112***
			(0.362)	(0.385)	(0.384)
EX_DISS*Neuroticism			1.673***	1.550***	1.550***
			(0.487)	(0.471)	(0.459)
EX_TEAM*Neuroticism			0.137	0.0886	0.0293
			(0.374)	(0.336)	(0.339)
EX_TEAM*Agreeableness			-0.507*	-0.549**	-0.542**
			(0.260)	(0.258)	(0.267)
N	1564	1564	1564	1564	1564
Events	140	140	140	140	140
AIC	1578.8	1482.2	1574.9	1478.5	1812.4
BIC	1605.6	1557.2	1628.4	1580.2	1930.2

Standard errors in parentheses; * p<.1, ** p<.05, ***p<.01

Table 5.4: Model 1-5

5.6 Results

Summary statistics for the variables that I use can be seen in Table 5.2 and a correlation of them is depicted in Table 5.3.

Table 5.4 depicts four multivariate hazard rate specifications. Models 1-4 are stratified, whereas Model 5 is a non stratified Cox estimation. In all of the models, the main effects represent the estimated effects of extraversion, agreeableness and neuroticism on the hazard rate of other exit reasons. Therefore, the exit interaction terms render the effect difference between the respective exit reasons and other exit reasons. According to Wei et al. (1989), robust standard errors obtained from a covariance matrix allow the testing of whether the hypothesized effects of extraversion, agreeableness and neuroticism differ between exits due to friction in the founder team, overinvestment or dissatisfaction with the job and other exit reasons. Since in case of exit due to job dissatisfaction the number of exits at 13 was relatively low and Models 4-5 were close to the proposed minimum number of 5 events per variable (Vittinghoff and McCulloch, 2007), even bootstrapped standard errors (see Efron and Tibshirani 1994) on the basis of 4000 replications were estimated (available upon request from the author). The bootstrapped standard errors show that the estimated robust standard errors are reliable.

In Models 3-5, besides the main effects of the Big Five traits only hypothesized interactions between extraversion, agreeableness and neuroticism with the regarding exit reasons are specified. Hypothesis 1 is not corroborated through the Models 3-5. Compared to the group of other reasons, the risk of exit due to overinvestment decreases with neuroticism, but the effect is non-significant. Models 3-5 show that, compared to other reasons for exit, the risk of exit due to job dissatisfaction positively relates to extraversion ($p \leq 0.01$), and neuroticism ($p \leq 0.01$). These results are in line with hypotheses 2a and 2b. The risk of exit due to friction in the founder team decreases with higher levels of agreeableness ($p \leq 0.1$ in Model 3 and $p \leq 0.05$ in Models 4-5), which accords with Hypothesis 3a. As the interaction effects between exits due to friction in the founder team and neuroticism are not significant in Models 3-5, Hypothesis 3b is not supported. As mentioned above, these interaction terms only recognize entrepreneurs who started team ventures.

Even though the stratified Cox Models 1-4 do not allow an easy interpretation of the relationship among the different failure types, they are useful for testing the hypothesis regarding whether a covariate has a diverse effect on different exit types. Because the relationship among the baseline hazard rates of the competing risks is totally unspecified, one cannot assess the exact effect of a covariate on the exit risk ratio among various exit reasons (Lunn and McNeill, 1995). However, if the

assumption of a proportional ratio among the baseline hazard rates of the competing risks is realistic, a simple Cox regression may be employed, which is shown in Model 5 in Table 5.4. Proportionality means that the underlying survival curve, which remains unspecified, is the same for all exit reasons. This permits a straightforward interpretation of the respective coefficients.

In comparison to Models 1-4, in Model 5 dummies representing the different exit reasons are added (exit because of other reasons is the comparison group) in order to estimate coefficients for the relative risks of exit. Correspondingly, the risk of exit due to job dissatisfaction is significantly lower (by a factor of exp(-7.733)) than exit due to other reasons *($p \leq 0.01$),* but the risk of exit due to overinvestment or friction in the founder team is not significant. The standard errors of the exit coefficients are relatively high, which indicates that the proportionality assumption is ambitious. However, the other coefficients and their significance changed only marginally compared to Model 4. All else being equal, an increase of the value in neuroticism by one unit increases the relative risk of exit due to job dissatisfaction at any time by a factor of exp.(1.550), while the relative risk of exit due to overinvestment at any time decreased by a factor of exp(-0.524). If these factors are respectively added to the main effect of neuroticism, exp(0.00527), the effect of neuroticism on the concerning exit reason may be obtained, given the baseline hazard rate.

5.7 Discussion

The present study investigates the relationship between personality and various motives of entrepreneurial exit. Hypothesis 1, which suggested that neuroticism is negatively related to exit due to financial overinvestment, is not supported by the empirical results. The findings indicate that, compared to the other reasons of exit, extraversion and neuroticism increase the risk of exit due to job dissatisfaction. These results are in line with hypotheses 2a and 2b. Finally, in comparison to other exits, the risk of exit due to friction in the founder team is significantly decreased by agreeableness, which corroborates Hypothesis 3a.

As Hypothesis 1 is not supported by the above results, the present work offers no evidence that personality traits should be linked with exits because of overinvestment of one's own financial resources. Future research may investigate more narrow traits that may be linked with this particular exit reason, like risk

aversion.

I found that exit due to job dissatisfaction was positively associated with extraversion and neuroticism, compared to other exit reasons. In this context, neuroticism therefore decreases the ability of people to cope with stress (Lahey, 2009) and it is negatively correlated with general well-being (McCrae and Costa, 1991; Weiss et al., 2007; Steel et al., 2008). Neuroticism also promotes negative emotions based on negative mood inductions (Larsen and Ketelaar, 1991). Neurotic entrepreneurs make exit decisions because they are more affected by their entrepreneurial responsibilities or personal conflicts, like the non-compatibility of leading an entrepreneurial firm and having a family (see Egeln et al., 2010). Therefore, my results provide evidence for the relationship between job dissatisfaction and neuroticism. It was previously expected that extraversion would positively relate to exits due to job dissatisfaction, compared to other reasons. My results thus show that positive emotions induced by extraversion can lead to entrepreneurial exits in case of job dissatisfaction. This might be explained in terms of the existence of more positive expectations about alternative employment if job dissatisfaction is sensed (Judge, 1992).

Finally, compared to other exit reasons, exit due to friction in the founder team negatively corresponds with agreeableness. This finding is in line with Hypothesis 3a. My results therefore contribute to the evidence for the importance of agreeableness for the outcome of team occupations (see Mount et al., 1998; Barrick et al., 2001). Friction in the founder team is fostered by low agreeable lead founders. In turn, disagreements in the founder team can end up in both a lower economic firm performance (see Jong et al., 2011) and a lower psychic income from leading an entrepreneurial firm, which simultaneously affect exit.

In Hypothesis 3b it was suggested that neuroticism has a positive relationship with exit because of frictions in the founder team. Although there is a positive effect across all the estimated models, neuroticism is not significantly related to exit due to friction in the founder team. Hence neuroticism does not enhance the likelihood that entrepreneurs will exit because of team disagreements. This finding is surprising, as neuroticism is shown to be positively associated with relationship conflict in founder teams (Jong et al., 2011). However, the present study does not account for the kind of conflicts which force exits because of friction in the founder team.

This study has several limitations. Firstly, the Big Five personality

measurement was taken ex post. Although the effects are small, the experience of withdrawing from an entrepreneurial venture can lead to slight changes in personality (Vaidya et al., 2002). Similarly, in young adulthood, personality is still in its development and moderate changes in the Big Five measures over time occur (Roberts et. al., 2006). Nevertheless, the mean age of entrepreneurs who exited at the time of start-up was over 40 and for those entrepreneurs who continued it is 38. It is thus reasonable to assume that age induced personality changes are not a notable problem in this study. Another issue that concerns the measures utilized in this study are the items that measure the regarding exit motives. These motives are complex and thus a scale consisting of several items may enhance the validity of the constructs. A replication of this study may thus help to validate the present results.

A third shortcoming concerns the neglect of the personality of the other founder team members in the case of frictions in the founder team. The frequency of conflicts is however also caused by dyadic personality constellations among team members (Bono et al., 2002). Future research into exits caused by frictions in founder teams should also attempt to recognize the personality of other founder team members. With regard to this problem, Jong et al. (2011) distinguish between task and relationship conflicts. The utilized data does not reveal whether entrepreneurs' withdraw from founder teams because of task or relationship conflicts. Furthermore, the relationship between personality and exit due to overinvestment might be mediated by extrinsic motivation (De Tienne et al., 2008) or values (Holland and Shepherd, in press), which are not considered in this study.

Finally, Table 5.1 indicates that the exit motives under investigation are interrelated. The respective number of exits, however, is too small to account for interactions. In this work, the investigation of relationship between personality and the various exit motives treats exit decisions separately. Even this approach may fall short of grasping the whole phenomenon of entrepreneurial exit, but it still helps to draw conclusions about the relationship between personality and various exit motives, even if they occur simultaneously. For instance, the above results show that neuroticism is significantly related to exits caused by job dissatisfaction rather than exits caused by friction in the founder team. Future work should take these interrelationships into consideration.

The present work makes several important contributions to this area of study. The above results demonstrate that entrepreneurial exit is not only affected by

economic considerations, but also by other factors, like well being, relationships and risk taking preferences. Viewing strategic exit decisions only from the point of economic firm performance may hence fall short of tackling the issue of entrepreneurial exit. This suggests that, as proposed by Gimeno et al. (1997), psychic income plays an important role in entrepreneurial exit decisions. In addition, I show that the personality of entrepreneurs is an important aspect in explaining various exit reasons. As a consequence, individual differences in explaining entrepreneurial exit decisions are not only related to human capital, opportunities or demographic factors (see Wennberg et al., 2010), but also with the personality of entrepreneurs. In conclusion, investigating factors that affect various exit reasons is a more fruitful approach for understanding exit decisions than just considering exit as a one dimensional phenomenon.

Moreover, the present findings contribute to the evidence that personality affects entrepreneurial outcomes (see Rauch and Frese, 2007; Zhao et al., 2010). In particular, the results point out that beyond human capital (Ucbasaran et al., 2003) and demographic or income determinants (Hellerstadt et al., 2007) various aspects of personality are related to entrepreneurial team exit. Investigating whether entrepreneurial team exits are mainly driven by relationship or task conflict (see Jong et al., 2011) is a possible future research avenue. The result that job dissatisfaction mediates between personality and entrepreneurial exit offers a contribution to the literature on job satisfaction and job turnover, which so far mainly focuses on employees rather than on entrepreneurs.

The present study provides evidence of several implications. As I find no effect for the relationship between personality and exit because of overinvestment of financial resources, strategic choices may generally help in avoiding these exit reasons. In this vein, entrepreneurship researchers suggest the principle of affordable loss in order to deal with entrepreneurial investments under uncertainty (Sarasvathy, 2001, 2005, 2008; Dew et al., 2009). Also, entrepreneurs are often advised to invest ex-ante a limited amount of money into a business venture, which they can cope with. In order to avoid job dissatisfaction, several measures have been proposed (Judge and Klinger, 2000). For instance, the entrepreneur may switch job positions, increasing tasks or job responsibilities within the entrepreneurial firm if possible. In order to avoid exits because of friction in the founder team, social skills may help entrepreneurs perform better in team settings (Morgenson et al., 2005). Less

agreeable entrepreneurs may need training in social skills (Baron and Tang, 2009), which could consequently decrease frictions in the founder team.

Beyond those recommendations, entrepreneurs who are prone to certain personality-related exit motives may employ self-regulating efforts to constrain the (negative) effects of their traits (Bledow et al., 2009). Successful self regulation comprises of self-reflection and an active reduction of one's own weaknesses. In addition, entrepreneurs should establish long-term goals which accord to their own preferences (Frese, 2007).

In conclusion, the present paper provides evidence that different motives drive the process of entrepreneurial exit and that those motives are related to the personalities of the entrepreneurs.

6 Chapter: Conclusion

The present thesis deals with the determinants of entrepreneurial entry and exit. Four empirical studies examine the determinants of entrepreneurial entry and exit behavior. The data from the studies is either collected by the author of this thesis (Chapter 3) or taken from the Thuringian Founder Study (Chapter 2 and Chapter 4-5). The perspective on entry and exit is at the individual or the firm level. In the next section, the findings are summarized and section 6.2. outlines several key implications.

6.1 Summary of the results

In Chapter 2, the determinants of the market novelty of entrepreneurial firms are in the focus. We develop a model which links a process perspective of markets with the nature of opportunities. Thereafter, at early stages of market development, opportunity creation is the dominant pattern of entrepreneurial behavior. In contrast, in relatively mature markets, opportunity discovery drives entrepreneurial action. Thus, we can test several hypotheses. As the distribution of market novelty is skewed, we utilize a quantile regression approach to account for that problem.

We find, as expected, that industry related experience negatively relates to market novelty. Hence, existing cognitive frameworks may be counterproductive for opportunity creation. The anticipated positive relationship between entrepreneurial experience and market novelty was not corroborated. Interestingly, we find a positive relationship between the lead founders' entrepreneurial personality profiles and market novelty. However, this association was only significant at the upper level of the distribution of market novelty. Thus, indeed, as Schumpeter (2002) predicts, personality may play an important role for entrepreneurs who act as creative destructors. Finally, the results in Chapter 2 suggest that the innovation strategy of firms affects their degree of market novelty. Hence, product innovation positively relates to market novelty, while process innovation or non-innovation negatively relates to market novelty (the comparison group is a product as well as a process innovation strategy).

In Chapter 3 of the present thesis, the relationship between technological discontinuities within an industry and the match between entry time, capabilities and survival is investigated. The empirical framework required to test this research

question is provided by the German farm tractor industry. The emergence of the multipurpose farm tractor around 1927 served as a technological discontinuity with competence destroying qualities within the German farm tractor industry.

As hypothesized, entry into the German farm tractor market was carried out endogenously. Therefore, entry after 1927 took place mainly in Southern Germany. Also, producers with a pre-entry experience of agricultural implements production had had a higher likelihood for entering after 1927. This result implies that mainly producers with regional and market related knowledge entered the new submarket. Considering the endogeneity of entry into the multipurpose farm tractor market, we also find that the match between required submarket related capabilities and resources ensured firm survival instead of cohort effects.

Entrepreneurial failure is investigated in Chapter 4. More precisely, we investigate the relationship between innovation and entrepreneurial failure. In addition, we examine the moderating effect of the Big Five personality traits of extraversion, openness and conscientiousness on the innovation failure relationship.

Entrepreneurial failure occurs when entrepreneurs leave their poorly performing firms, which they have (co-)founded. The question of whether entrepreneurs left their firms because of economic or other reasons is answered with the help of self reports and external bankruptcy data. We use both kinds of evidence, as firms which have not filed as bankrupt may still perform poorly (Wennberg et al., 2010).

Our findings suggest that innovation activities decrease the likelihood to fail. We consider observed endogeneity by a Cox regression stratified on the propensity to innovate. An additional finding suggests that, as hypothesized, extraversion strengthens the negative relationship between innovation and entrepreneurial failure, while openness weakens it. Surprisingly, in contrast with our hypothesis, conscientiousness weakens the innovation entrepreneurial failure relationship. The study implies that innovation is a more promising strategy than non-innovation. Moreover, regarding the successful implementation of innovations, the personality of the lead founding entrepreneur has to be taken into consideration. Negative effects of the personality of the founder may be outbalanced by experienced business consultants or individual trainings (e.g. on social skills).

Chapter 5 deals with the various motives for entrepreneurial exit. Entrepreneurial exit is here defined as when an entrepreneur leaves the firm that he

or she created. In general entrepreneurial exit is understudied (DeTienne, 2010). The chapter builds up on the model of Gimeno et al. (1997), which proposes that beyond financial rewards, even psychic income may be yielded from business ventures. Psychic income hinges on the personality of the entrepreneur. The main reasons for entrepreneurial exit are an overinvestment of one's own financial resources, friction in the founder team and exit due to job dissatisfaction.

Regarding the first reason, I expected there to be a negative relationship between neuroticism and exit due to financial overinvestment. However, the data does not support this hypothesis. Entrepreneurial exit because of friction in the founder team is negatively related to agreeableness, which is an expected result. Finally, the hypothesized association between extraversion and exit because of friction in the founder team is supported. The study shows that entrepreneurial exit is not always reasoned by an economically poor performing firm. Moreover, personality may partly explain why entrepreneurs leave their firms for certain reasons.

The next section offers some implications which may be derived from the studies which are introduced above.

6.2 Implications

As in the respective chapters the particular implications of the studies are discussed, in this section I focus on general implications of the present thesis.

The present thesis offers several contributions. First of all, it demonstrates that entrepreneurial entry and exit are multidimensional phenomena, which have been quite neglected. Hence, using entrepreneurial entry or exit as dependent variable without considering the multidimensionality of those constructs may lead to the wrong conclusions. In other words, bi- or multidirectional effects of explanatory variables for various entry or exit phenomena may be neutralized in the case of looking on entry and exit only per se. For instance, taking only individual entrepreneurial exit as a performance measure can involve cases where entrepreneurs have left their firms because of retirement. However, certain individual or firm characteristics, which have an effect on economic firm performance, may not have an effect on retirement. The effect size of an explanatory variable is then biased. Consequently, future research into entrepreneurial entry and exit ought to consider multidimensionality in more depth.

This issue is especially relevant if policy measures to foster entrepreneurship or to avoid entrepreneurial failure are being designed. Some of the results in this thesis imply that different entrepreneurial determinants affect the market novelty of entrepreneurial firms or various exit motives. Thus, if policy goals concern the avoidance of economic entrepreneurial failure, the measures ought to focus particularly on failure. Similarly, if the policy aim is to foster ventures with a high degree of market novelty, different actions possibly have to be made other than supporting entrepreneurial entry in general.

Another implication of this thesis concerns endogenous entry decisions in industry evolution and entrepreneurship research. The results of Chapters 2, 3 and 4 indicate that entry decisions are endogenous. Also, it is demonstrated that not considering endogeneity may result in strongly biased estimates. In particular, entry into industries or submarkets of industries strongly relies on resources and capabilities. However, the firm survival studies in industry dynamics research conducted so far hardly recognize that fact. In a similar vein, performance studies of individual entrepreneurs usually do not take into consideration that they may self-select into innovative activities. Future research into both areas thus may be enriched by acknowledging endogenous entry decisions.

In addition, Chapters 3, 4 and 5 suggest that individual and firm exits often consist of interaction between entrepreneurial characteristics and contextual factors. This falls short only observing entrepreneurial exit behavior from an environmental or an individual/firm perspective. Consequently, measurements that aim to influence exit behavior ought to account for both the individual/firm level and the context. Likewise, future research may need to focus in more depth on the interaction between environments and firms or individual aspects of entrepreneurial outcomes. In the words of Pierce and Aguinis (2011, p. 3): “everything in moderation, nothing in excess”.

The studies in this thesis provide some new insights into entrepreneurial entry and exit behavior. However, further opportunities for research in this area certainly exist. With respect to endogeneous entry decisions, an instrument variable may outperform the utilized propensity score approach. This is especially valid if unobserved heterogeneity exists. However, a main drawback of such an instrument is the impossibility of testing for its correlation with the error term. Therefore, the researcher has to reason theoretically why an instrument is “really” exogenous

(Angrist and Krueger, 2001). One then may ask the question: “why test theory with theory?“

Another rather sparsely investigated area in entrepreneurship research is the consideration of mediators between human capital or personal dispositions of entrepreneurs and entrepreneurial exit. For instance, the relationship between personality and exit because of friction in the founder team may be mediated by relationship conflict (see Jong et al,. 2011). Future research may gain insights theoretically and empirically regarding this research avenue. Likewise, there may exist mediators between individual dispositions and the market novelty or innovativeness of entering entrepreneurs. For instance, Amabile (1997a) proposes that (entrepreneurial) creativity moderates the relationship between personal characteristics of entrepreneurs and market novelty or innovation. Again, those relationships may be investigate in future studies.

A rarely investigated issue is the effect of cascades of entrepreneurial activities. This is relevant on the firm level, where mainly the effect of pre-entry experience on performance is investigated rather than different biographical firm patterns. Even at the level of the individual entrepreneur, studies of the effect of previous failure on entrepreneurial failure are scarce. Similarly, the effect of success of firms or entrepreneurs in one branch of entry and exit behavior in other branches can be understudied. Future research may thus shed some more light on necessity entry, opportunity entry and their consequences for market success. For instance, after World War II, many entrants into the German farm tractor industry entered the market because they were not allowed to become armament producers (see Bauer 1987).

In conclusion, this thesis provides new insights into entrepreneurial entry and exit decisions, which involve some interplay between individuals, firm characteristics and the environmental setting.

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Appendix A to Chapter 2

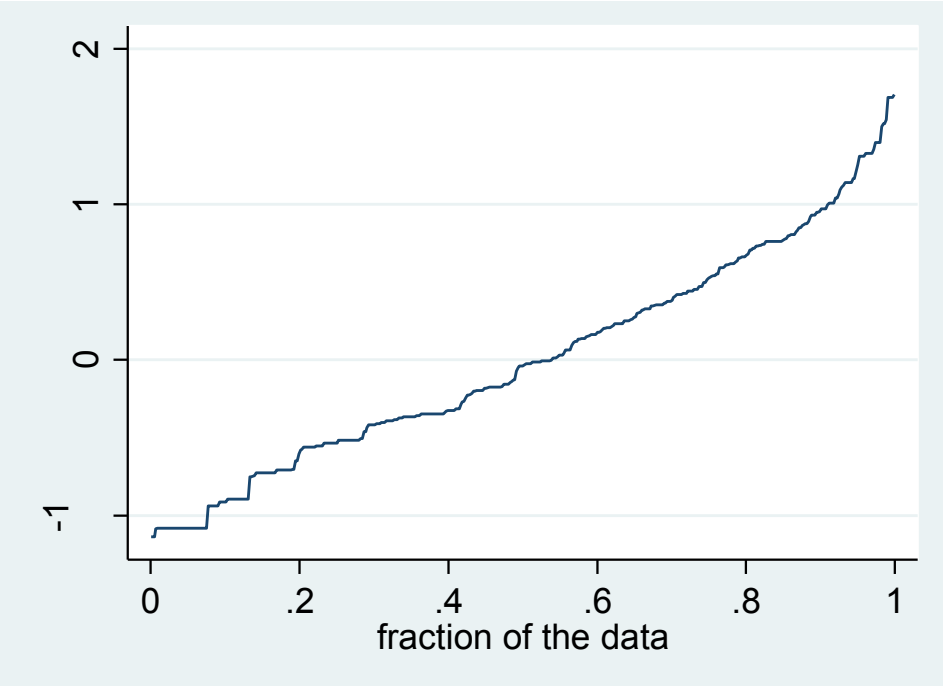

Figure A.1: Lorenz curve of the dependent variable market novelty

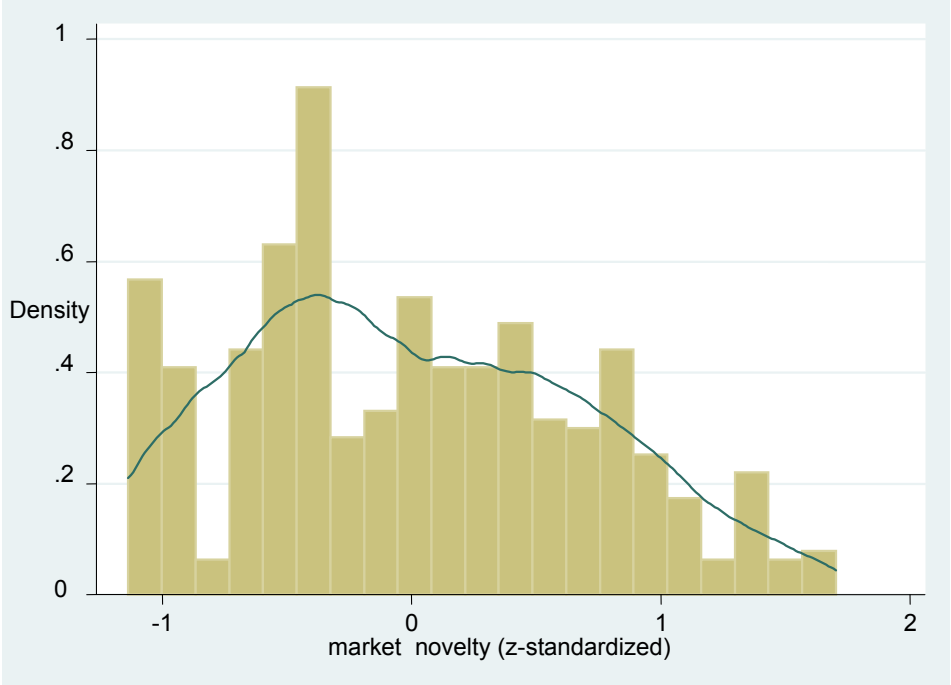

Figure A.2: Histogram with kernel density estimation of the dependent variable market novelty

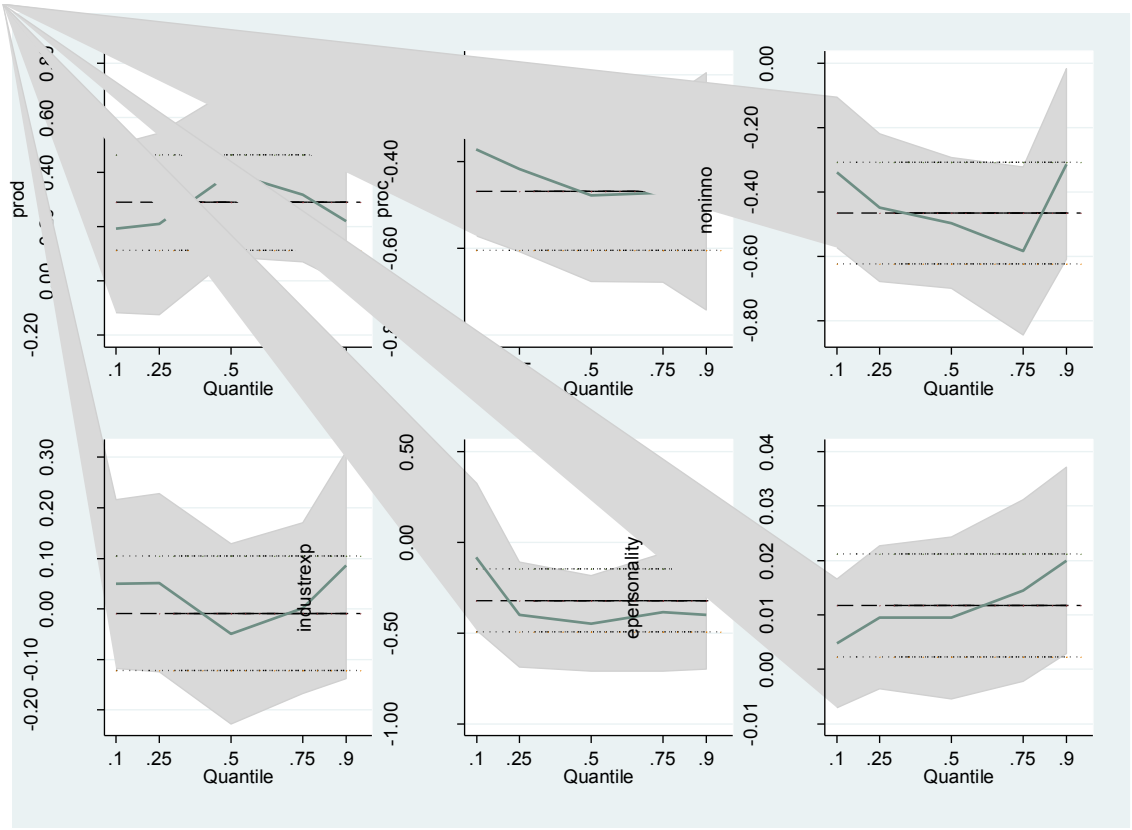

Figure A.3: Quantile regression with market novelty as dependent variable (vertical axes show coefficient estimates of named explanatory variable over the market novelty distribution; horizontal axes depict the quantiles of the dependent variable). Quantile regression error bars correspond to bootstrapped 95% confidence intervals (100 replications). Horizontal lines represent OLS estimates with 95% confidence interval.

Appendix B to Chapter 4

Big-Five trait	Item	Factor1	Factor2	Factor3	Factor4	Factor5
	sparsam - verschwenderisch	**0.351**			-0.4353	
	ordentlich - unachtsam	**0.7344**				
	übergenau - ungenau	**0.7309**				0.2312
	gründlich - unsorgfältig	**0.8002**				
Conscientiousness	geschäftstüchtig - verspielt	0.2974	**0.3351**		-0.3822	
	strebsam - ziellos	**0.4486**				-0.3725
	geordnet - ungeordnet	**0.6488**				
	fleißig - faul	**0.6538**				
	gewissenhaft - nachlässig	**0.8445**				
	gesprächig - schweigsam		**0.6826**			
	anschlußbedürftig - einzelgängerisch		**0.4665**	0.3118		0.3817
	direkt - taktierend		**0.2479**			
	offen - zugeknöpft		**0.7381**			
Extraversion	impulsiv - selbstbeherrscht		0.3344	-0.4545		**0.5764**
	aktiv - passiv		**0.3765**			-0.3366
	kontaktfreudig - zurückhaltend		**0.8165**			
	freimütig - gehemmt		**0.6752**			
	gesellig - zurückgezogen		**0.7461**			
	nachsichtig - barsch			**0.6515**		
	friedfertig - streitsüchtig			**0.719**		
	leichtgläubig - zynisch			**0.5577**	-0.2175	0.3718
	gutmütig - reizbar			**0.6732**		-0.227
Agreeableness	weichherzig - rücksichtslos			**0.5589**		0.2324
	höflich - grob	0.2755		**0.4483**	0.3531	
	selbstlos - selbstsüchtig			**0.3374**		
	vertrauensvoll - misstrauisch		0.2385	**0.4898**		
	zustimmend - gegensätzlich	0.2238		**0.4177**		
	künstlerisch - unkünstlerisch				**0.3624**	0.2068
	komplex - einfach			-0.2458	**0.4849**	
	phantasievoll - phantasielos		0.2117		**0.3029**	-0.2667
	originell - konventionell		0.347		**0.3897**	
Openness	kreativ - unkreativ	0.2083			**0.3987**	
	modern - traditionell				**0.4289**	
	intelligent - unintelligent				**0.3731**	-0.3911
	gebildet - ungebildet				**0.3632**	-0.2279
	liberal - konservativ	-0.2769			**0.55**	
	überempfindlich - entspannt	0.2318		-0.3592		**0.4672**
	labil - gefühlsstabil					**0.648**
	selbstachtungslos - überzeugt		-0.2246			**0.4042**
	verletzlich - robust					**0.597**
Neuroticism	furchtsam - mutig		-0.4047			**0.2833**
	ängstlich - ruhig		0.223			**0.6679**
	hilflos - selbstvertrauend					**0.4878**
	selbstmitleidig - selbstzufrieden					**0.3465**
	unsicher - sicher	-0.2839	-0.3354			**0.3813**

Only |loads|>.2 are indicated; values in bold show the highest load per item

Table B.1: Principal component factor analysis with promax rotation with the employed items

Hiermit erkläre ich, Sebastian Wilfling,

1. dass mir die geltende Promotionsordnung bekannt ist;

2. dass ich die Dissertation selbst angefertigt, keine Textabschnitte eines Dritten oder eigener Prüfungsarbeiten ohne Kennzeichnung übernommen und alle von mir benutzten Hilfsmittel, persönlichen Mitteilungen und Quellen in meiner Arbeit angegeben habe;

3. dass ich bei der Auswahl und Auswertung des Materials sowie bei der Herstellung des Manuskriptes keine unzulässige Hilfe in Anspruch genommen habe;

4. dass ich nicht die Hilfe eines Promotionsberaters in Anspruch genommen habe und dass Dritte weder unmittelbar noch mittelbar geldwerte Leistungen von mir für Arbeiten erhalten haben, die im Zusammenhang mit dem Inhalt der vorgelegten Dissertation stehen;

5. dass ich die Dissertation noch nicht als Prüfungsarbeit für eine staatliche oder andere wissenschaftliche Prüfung eingereicht habe;

6. dass ich nicht die gleiche, eine in wesentlichen Teilen ähnliche oder eine andere Abhandlung bei einer anderen Hochschule bzw. anderen Fakultät als Dissertation eingereicht habe.

Jena, den 15. Januar 2013